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## Evaluation of engagement in reflective practice by radiographers in Enugu Metropolis, southeast Nigeria

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### Abstract

**Background:** Reflective practice (RP) is the mental processing of problems that requires application of conceptual knowledge during clinical practice.

**Objective:** To investigate engagement in RP by radiographers in the Enugu Metropolis to determine the effectiveness of curricula and teaching method.

**Methods:** The prospective cross-sectional study involved all 50 registered radiographers working in Enugu Metropolis in 2014. Informed consent of the respondents was obtained. A semi-structured questionnaires, and observation method, were used for data collection. Data were analysed using SPSS Version 17.0. Descriptive statistics were computed and Chi-square was used to test the significance of results at  $p < 0.05$ .

**Results:** Seventy-four percent of respondents engaged in RP; whereas 22% were ill-equipped for this practice. Respectively, 74%, 68%, 72% and 74% of respondents would tinker patient positioning, projections, technical factors and immobilisation. Managers' attitude, superiors' attitude, ageing equipment, and patients' age/condition (80%, 73.3%, 66.7%, and 60%, respectively) discouraged engagement in RP. Eighty-eight percent of respondents with 0-4 years of clinical experience engaged in RP; whereas 72% of those with  $\geq 20$  years clinical experience did.

**Conclusion:** Radiography curricula and andragogy appear to have largely been effective in the education/training of radiographers in Nigeria. Engagement in RP, however, tended to decrease with clinical experience.

**Keywords** theory-practice dichotomy; education; radiography

### Introduction

Radiography is one of the professions allied to medicine that has benefited most significantly from advances in technology. Technological advances, especially in the last few decades, for instance, have resulted in changes in equipment design with resultant improvement in image quality and reduction in patient and staff ionising radiation exposures during medical diagnostic imaging.<sup>[1]</sup> In addition, computer-based imaging modalities such as computed tomography (CT), magnetic resonance imaging (MRI), ultrasonography (US), single photon-emission computed tomography (SPECT) and positron emission tomography (PET) are now available.

Radiography practice has also significantly changed over the years. Apart from adapting to changes in equipment design, radiographers in the 21<sup>st</sup> century must now endeavor to embrace the current global paradigm shift towards evidence-based medical practice.<sup>[2]</sup> For diagnostic imaging to continue to play its pivotal role in this era of evidence-based medical

practice, radiography education and training programmes should be planned in order for radiographers to become more versatile, resourceful and be able to think quickly. In other words, radiographers, just like other healthcare professionals, must evolve and become problem-solvers in their practice.<sup>[3]</sup> Post-graduate radiographers should thus be well prepared to engage in reflective practice (RP). They should also possess an in-depth conceptual knowledge and be able to combine such conceptual knowledge with available clinical evidence to solve unexpected clinical problems during practice.<sup>[3]</sup>

The RP theory was proposed by Schon. It refers to mental processing of a problem. It is a process by which 'you stop and think about your practice, consciously analyse your decision making and draw on theory and relate it to what you do in practice'. It also allows health professionals to engage in 'critical analysis and evaluation to re-focus their thinking on existing knowledge in order to generate new knowledge and ideas'.<sup>[3]</sup> It helps medical and allied professionals understand their own inten-

tions, values and visions. It supports them to work in a challenging field in which (i) their ethics and morals may be tested, (ii) where power relations may be decidedly unequal, and (iii) where the environments in which they work are emotionally and physically demanding.<sup>[4]</sup> It involves identifying and analysing a relatively complicated and often unanticipated problem for which there is no obvious solution and relying on existing knowledge to proffer a solution. It is characterised by a cycle of events including observation, evaluation, analysis, and drawing up a plan to guide future practice.<sup>[5]</sup>

Among reflective practitioners, unanticipated clinical problems trigger two kinds of RP: reflection in action and reflection on action. The former is immediate. It is the ability to learn and develop continually by creatively applying current and past experiences and reasoning to unfamiliar clinical situations as they occur. Reflection on action occurs later; it is the process of thinking back on what happened in a past clinical scenario, what may have contributed to its occurrence, whether

actions taken were appropriate and how the situation may affect future practice.<sup>[6]</sup> Theory informs practice.<sup>[5-7]</sup> Reflective practitioners identify clinical problems, critically analyse them to determine their nature/cause and then solve them by combining theoretical knowledge with clinical evidence. RP appears to have captured the whole essence of evidence-based practice. Most university curricula in radiography seem to have been planned in such a way as to inculcate RP in student radiographers during their education/training.<sup>[8]</sup> We require theoretical knowledge to understand 'real life' situations in the wards and clinics.<sup>[7]</sup> Ways to encourage radiographers to engage in RP include higher level education, adoption of effective teaching methods, as well as the use of state-of-the-art X-ray equipment during clinical practice.<sup>[8]</sup> Dynamism in education makes 'theories more impactful on practice'.<sup>[9]</sup>

Tertiary (university) education, in combination with clinical training, helps medical and para-medical students develop critical thinking skills.<sup>[10]</sup> Radiography training was upgraded from diploma to degree level of education in Nigeria in the early 1980s. Most curricula of the five-year radiography Bachelor of Science (BSc) degree programmes are quite similar. Attempts seem to have been made to strike a balance between didactic (classroom) education and clinical training in each curriculum. For instance, radiography students are taught theoretical concepts in the classroom in the first three years after gaining university admission, but they are mandated to go to designated clinics to observe and participate in practical sessions so as to acquire clinical skills.

Competence-based learning (CBL), which is the main thrust of current medical and radiologic sciences education,<sup>[11]</sup> is prominent in the radiography curricula. In line with CBL, measurable skills (competences) that are expected to be acquired, and deadlines for achieving them, are well defined in the curricula. On the other hand, andragogy is the teaching method adopted in most Nigerian universities. This may possibly be due to the assumption that andragogy encourage adults to learn and to solve unanticipated problems by relying on their experiences.<sup>[11]</sup>

In the first three years of the Nigerian radiography university programmes, medical and para-medical students are

taught basic science (biology, chemistry, mathematics and physics) and medical (anatomy, biochemistry and physiology) courses. They also attend practical demonstrations in different laboratories after some lectures, but within the same week any course is taught. At the end of the 3<sup>rd</sup> year, at least 2 to 3 days per week are dedicated to classroom lectures; the remaining days are spent in an X-ray clinic. For additional practical experience, students are required to spend part of every long vacation period in accredited X-ray clinics that are not included during term training facilities. Graduating students are required to undertake a research project under the supervision of an academic lecturer. Prior to graduation, they are required to submit a logbook with details of clinical attendance and their level of participation in carrying out different X-ray procedures.

Large group teaching method is adopted in most cases. Due to the size of classes, some lecturers and tutors find it difficult to undertake formative assessments to ensure that lectures and practical sessions are well understood. Consequently, end of semester and or end of session examinations are the only means of gauging the efficacy of teaching and learning ability of the radiography programmes. A range of student assessments are undertaken: essay and multiple choice questions to test students' recall abilities; students either undertake examinations on patients or go through an objective structured clinical examination (OSCE) using mannequins; viva voce sessions are included to create likely challenging clinical scenarios in order to assess reflective thinking ability among students. At the end of the 3<sup>rd</sup> year, teaching of X-ray procedures commences with routine examination of extremities. Students also commence clinical attendance. It is to be expected that if radiography education and training curricula are well delivered, then post-graduate radiographers should be well grounded in both theoretical and practical knowledge. They should develop personal intellectual capabilities that will engender sound and ethical decision-making ability based on available clinical evidence.<sup>[8]</sup> It is also expected that Nigerian radiographers should be able to satisfy all necessary technical competence requirements of regulatory authorities.<sup>[12]</sup> Education and training should ensure that during clinical practice, radiographers are able to create knowledge, either as individuals or as

members of a community of practitioners. They should be able to consistently guard against sliding into what has been described as 'habitual and often dysfunctional practice'.<sup>[13]</sup>

Technology is constantly changing, so curricula and teaching methods should be dynamic to ensure that objectives are attained.<sup>[9]</sup> Evaluation is necessary to determine whether goals, standards or objectives set have been met by education and training programmes.<sup>[14]</sup> An end of semester, end of session or end of course examination does not provide adequate feedback on post-graduate competence. To obtain such feedback will require monthly, quarterly or yearly evaluation at the end of programmes to determine their success so that data obtained can be used by curricula planners.<sup>[15]</sup> Assessment of engagement in RP is a measure of the adequacy of the curriculum, as well as the effectiveness of education and training of radiographers.<sup>[8]</sup> Indifference to the tenets of RP have, however, been reported among health professionals including radiographers in developed countries.<sup>[7,8]</sup>

To the best of the authors' knowledge, there has not been any follow-up study to determine the effect of the degree level of education on radiography practice in Nigeria. The aim of this study was to determine the level of engagement in RP by radiographers in Enugu Metropolis, southeast Nigeria, to determine the effectiveness of radiography curricula and teaching method in the country.

## Subjects and methods

A prospective cross-sectional study was carried out in Enugu, Southeast Nigeria, between April and August, 2014. Convenience sampling method was used to select four X-ray centers in public and private hospitals (represented by H1, H2, H3 and H4) in the metropolis. Ethical approval for the study was obtained from each institution's research and ethics review board. Fifty (n=50) radiographers gave informed written consents to participate in the study. Before the study started, one of the researchers visited each of the study centers during weekly seminar sessions held on different days in each center to introduce the study to the radiographers. Inclusion criteria were: radiographers with a BSc degree obtained from a Nigerian university; registration and licensed to practice radiography by the Radiographers' Registration Board of Nigeria (RRBN).

## Data collection and analysis

Data were collected using a semi-structured, self-administered questionnaire and observation method. Knowles' 7 principles of andragogy,<sup>[16]</sup> and Miller's pyramid of clinical competence,<sup>[17]</sup> were used as guides to compile a questionnaire to assess engagement in RP.

The questionnaire comprised sections A and B. Section A provided bio-data of the respondents. Section B addressed assessment of RP. To ensure validity and reliability of the study, the questionnaire was reviewed by an experienced researcher. A pilot study was undertaken at each of the study sites. Three radiographers from each site (n=12) participated in the pilot study. Their responses were analysed and a final questionnaire was compiled. Fifty (n=50) questionnaires were prepared. For easy identification needed for follow-up, questionnaires were colour-coded for each center. The respondents in each center were given a code known only to the researchers.

Before being recruited, radiographers were told that an aspect of the study required them being observed at work by an unidentified research assistant. The day and time of observation were, however, not revealed to them to reduce undue influence on the observers. Fifty radiographers (n=50) gave consent to participate in the study and were subsequently recruited. Questionnaires were administered by one of the researchers. The respondents were requested to complete them as quickly as possible. They all complied and fully completed the questionnaires were received within 48 hours.

To validate the completed questionnaires, two post-graduate radiographers were recruited and trained by the researchers to observe the participants, who did know they were being observed. They were observed for five days before their respective engagement in RP was scored on a 2-point scale. Scoring was done by ticking either the box beside the word 'good' or the one beside the word 'poor'. A 'good' score meant that the scorer was satisfied with the respondent's engagement in RP while a 'poor' score meant that engagement in RP was unsatisfactory.

To identify factors that discouraged engagement in RP, those who were identified not to have satisfactorily engaged in RP (n=15) were approached once again

and each was given a form with a list of statements. They were requested to tick YES/NO for each statement. A YES tick meant they believed that the statement described what significantly influenced them during practice.

Data were analysed using SPSS computer software, version 17.0 (SPSS Inc, Chicago, Illinois, USA). Percentages were calculated and used to determine both the factors that led to engagement in RP and those that hampered engagement in RP. The percent of respondents who engaged in RP was plotted against clinical (job) experience. This was done to underscore the effect of job experience on engagement in RP. Chi-square was used to test for statistical significance of results at  $p < 0.05$ .

## Results

Fifty questionnaires were completed and returned. Male and female respondents were 68% (n=34) and 32% (n=16) respectively; mean age was  $36.28 \pm 9$  years, and mean job experience was  $15.34 \pm 12$  years (Table 1).

Thirty-seven (74%) engaged in RF, and 13 (26%) did not. Thirty-nine (78%) agreed that education and training adequately prepared them for unanticipated clinical challenges during practice and 11 (22%) disagreed. Thirty-seven (74%) said they communicated effectively during practice and 13 (26%) did not. Thirty-four (68%) adhered to radiation protection and infection control and 16 (32%) did not. Thirty-six (72%) said they were innovative in achieving patient immobilisation; 14 (28%) were not (Table 2).

On independent verification, 35 (70%) engaged in RF; 15 (30%) did not (Table 3). Thirty (60%) were identified to have engaged in RP by communicating effectively during practice, and the remainder (20/40%) did not. Fourteen (28%) did not adhere to radiation and infection protection practices.

Among those who were identified by independent observers not to have engaged in RP (n=15), 12 (80%) said that the use of obsolete X-ray equipment was the chief impediment to engagement in virtuous practice (Table 4). Other factors, namely influence of senior colleagues (73.3%), excessive demand for increased patient throughput per day by radiography managers (66.7%) as well as age and condition of patients (60%) were said to discourage engagement in RP.

Job experience had some effect on engagement in RP (Figure 1): 88%, 75%, and 72% with 0-4, 5-9 and  $\geq 20$  years' job experience, respectively.

## Discussion

In this study, a significant percentage of respondents engaged in RP. In particular, most reported that university education and clinical training adequately prepared them to anticipate and handle unexpected clinical problems. The opinion that 'medical and para-medical professionals who are convinced that they were well prepared through education and training programmes ('agreement') tend to engage more in RP than those who do not'<sup>[18,19]</sup> is supported in this study. Most seemed to have developed adequate professional

**Table 1. Age range and length of job experience of respondents**

AGE RANGE (YEARS)		MEAN $\pm$ SD (YEARS)
20-24	4 (8%)	36.28 $\pm$ 9
25-29	6 (12%)	
30-34	11 (22%)	
35-39	16 (32%)	
40 and above	13 (26%)	
<b>Total</b>	<b>50 (100%)</b>	
JOB EXPERIENCE (YEARS)		
1-4	8 (16%)	15.34 $\pm$ 29
5-9	11 (22%)	
10-14	15 (30%)	
15-19	10 (20%)	
20 and above	6 (12%)	
<b>Total</b>	<b>50 (100%)</b>	

SD = standard deviation

**Table 2. Engagement in RP as reported by respondents**

	ENGAGED IN RP	DID NOT ENGAGE IN RP	P VALUE
Education/training adequately prepared me for clinical practice therefore, I can handle unexpected clinical problem successfully without much guidance and I find theoretical knowledge helpful during practice	39 (78%)	11 (22%)	<0.05
I consider communication with patient/patient's relation/medical staff/peruse case note in order to obtain more information very necessary no matter the situation	37 (74%)	13 (26%)	
I performs additional/modified views when patients' conditions requires them in line with prevailing clinical problems either to make and or to clarify diagnoses and I adhere to radiation protection and infection control practices during practice even in emergency situations	34 (68%)	16 (32%)	
I try new approach to achieve immobilization when use of conventional methods is not practicable and I consult senior colleagues for advice sometimes and I follow-up to my cases and I also carry out regular audit of my practice and report successes/challenges	36 (72%)	14 (28%)	
Average	37 (74%)	13 (26%)	

RP = reflective practice

**Table 3. Engagement in RP as reported by the independent observers**

	ENGAGED IN RP	DID NOT ENGAGE IN RP	P VALUE
Even in emergency situations, radiographers communicated effectively and sought information either by interviewing the patient/patient relation or accompanying medical staff or by perusing patient's file	30 (60%)	20 (40%)	<0.05
Always practiced radiation/infection protection during chaotic emergency cases	36 (72%)	14 (28%)	
Adapts to clinical situations; Carries out additional views when needed; maneuvers technical details such as centering points, x-ray tube tilting and consults colleagues sometimes; attempts unconventional techniques in achieving immobilization in some cases	38 (76%)	12 (24%)	
Average	35 (70%)	15 (30%)	

RP = reflective practice

**Table 4. Factors that discouraged engagement in RP**

	SIGNIFICANTLY DISCOURAGED RP	DID NOT SIGNIFICANTLY DISCOURAGE RP	P VALUE
Managers' demand for increased throughput per day poses a lot of challenge to best practice.	12 (80%)	3 (20%)	<0.05
I think that senior colleagues who consider theory not to be very important in practice are correct.	11 (73.3%)	4 (26.7%)	
I consider it improper to attempt to practice radiography as I was taught when I use very old x-ray machines.	10 (66.7%)	5 (33.3%)	
When handling pediatric, very old and very ill patients, attaining best practice is inconceivable.	9 (60%)	6 (40%)	

RP = reflective practice

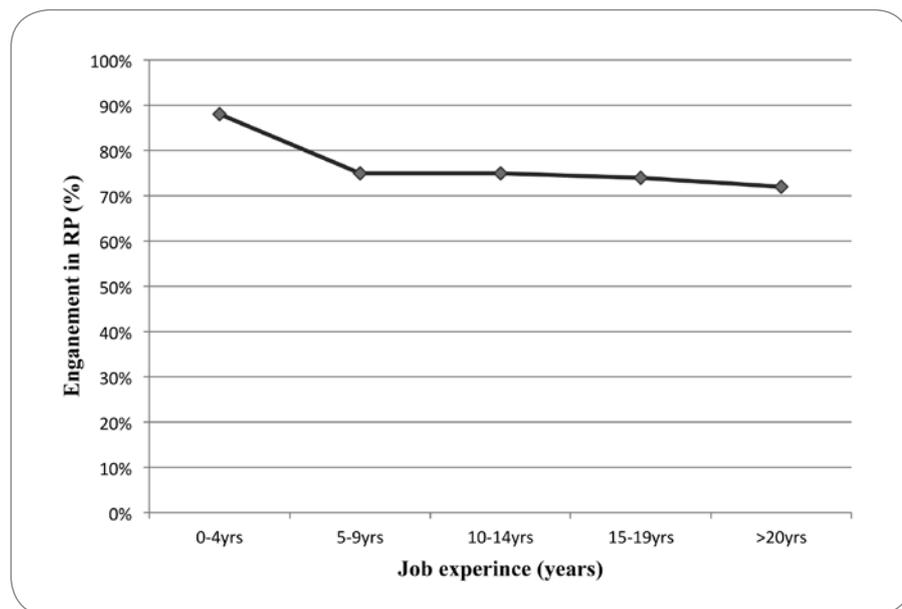
confidence (this is referred to as 'self-efficacy'), namely they are able to handle unexpected clinical challenges without much supervision. This is in tandem with the assertion that healthcare professionals, who acquired the capability, and had to deal with unexpected clinical challenges during education and training tend to engage more in RP post-graduation.<sup>[20]</sup> Radiographers may or may not satisfactorily engage in RP depending on the attitude of their senior colleagues to it.<sup>[8]</sup> It has also been suggested that self-efficacy usually thrives among younger radiographers who observe their senior colleagues successfully perform unfamiliar tasks and

vice versa.<sup>[5]</sup> In this study, engagement in RP appears to have been adequately addressed in the curricula, and has over the years been well delivered by radiography teachers in Nigeria. Radiography curricula, and the method of teaching appear to have significantly achieved their aim of producing competent radiographers in Nigeria.

Engagement in RP in this study is slightly lower than radiographers in Australia,<sup>[8]</sup> and nurses in Europe.<sup>[7]</sup> Radiography classes in Nigeria are quite large (between 70-150 in most universities). Adequate supervision of students by lecturers and

clinical tutors is difficult thus teaching and learning may not have been optimal. It is also highly probable that extremely infrequent revision of radiography curricula, to reflect changes in technology and teaching, could be a contributing factor. Some of the respondents may belong to the group who are of the opinion that theory and practice are different entities that should be separated.<sup>[9]</sup>

In terms of engagement in RP 74% and 60% as shown in Tables 2 and 3 communicated effectively during study. They interviewed patients and or sought to obtain more information from their relations or



**Figure 1.** Graph showing the effect of job experience on engagement RP

perused case notes. To justify any modifications to the X-ray request, radiographers often use information obtained from interviewing a patient or his/her relatives, the medical staff who accompanied the patient to the department; or perusing patients hospital records when necessary.<sup>[8]</sup> The findings of this study suggest that most respondents in the study sites appear to have acquired both critical thinking and defensible ethical decision-making skills during their education and training.<sup>[21]</sup> As shown in Tables 2 and 3, effective communication was not evident in 26%, and 40% of respondents which was also evident in an Australian study.<sup>[8]</sup> This, in our view, may be due to talk less and work more, which is often intoned by some managers in study sites. Chattering while attending to patients should not be encouraged, but the advantages of effective communication with patients and or medical staff to obtain more information to assist in making diagnoses should not be overlooked either.

In terms of adherence to the tenets of radiation protection and infection control even during emergencies the findings (as shown in Tables 2 and 3) were 68% and 72%. This understandably is the minimum standard any radiographer should bear in mind. A similar study concluded that consistent adherence to standard radiation protection and infection control practices is a measure of good practice and is also indicative of engagement in RP.<sup>[8]</sup> The others in this study were not compliant. We did not investigate what caused the

poor attitude to radiation protection and infection control practices. Some investigators have reported that a significant proportion of radiographers saw adherence to radiation protection and infection control practices as 'a waste of time'.<sup>[8]</sup>

As evident in Table 3, 68% and 72% demonstrated engagement in RP by being innovative even in challenging situations and frequently reviewed their work with senior colleagues. This could imply that most seem to have assimilated what was described by some investigators as 'reflection in action and reflection on action'.<sup>[6]</sup> In a similar study, an audit of practice by radiographers such as carrying out analyses of film reject rates was recognised as a useful way to demonstrate engagement in RP.<sup>[8]</sup> In this study 32% and 24% were not so innovative. The reasons thereof were not obtained. We are inclined to agree that curricula delivered by medical/paramedical educators are often less dynamic and engaging than is expected as technology changes.<sup>[12,13]</sup> It is therefore possible that a significant number of respondents did not fully acquire the 'artistry' of problem framing, and improvisation in a technologically mediated profession during education and training.<sup>[22]</sup>

Several factors discouraged engagement in RP (see Table 4). These include the demand by radiography managers for increased throughput of patients per radiographer per day (80%), poor attitude of some senior colleagues to RP (73.3%),

continued use of very old and or obsolete x-ray equipment (66.7%), and the condition and age of patients (60%). These results are similar to other studies.<sup>[7,8, 23-25]</sup>

It was not uncommon for respondents in this study being pressurised by their managers, who insisted that each radiographer has to complete a given number of cases within the shortest time possible. Students were often not allowed to attend to patients for fear of film wastage. This supports the notion that attempts by some radiographers to engage in what has been described as 'virtuous practice' is often hindered by the attitude of radiography managers whose motive is largely to 'meet the departments' bottom line'.<sup>[8,24]</sup>

The attitude of senior colleagues was another factor that significantly discouraged engagement in RP. In this study, for instance, it was not uncommon to hear some senior radiographers describe most younger colleagues' insistence on having some very necessary items, such as gonad shields and latex hand gloves, as 'being too academic'. We did not establish why some senior radiographers were apathetic to RP. In a similar study it was reported that some students, who were eager to carry out what has been described as 'virtuous radiographic practice,' were discouraged by some senior radiographers who saw such practice as a mere waste of time.<sup>[8]</sup>

The continued use of old X-ray machines, as well as the age/condition of patients, also significantly discouraged engagement in RP. While 67% said that it was improper to 'attempt to practice radiography as they were taught' when using very old X-ray machines, 60% said that aspiring to attain best practice was not to be considered when handling old, very ill or pediatric patients. As evident in the literature of radiographers, nurses, and doctors, the results of this study support the fact that excess work load, condition/age of patients and the functional state/age of machines are factors that discouraged engagement in RP by medical and allied healthcare professionals.<sup>[23-27]</sup>

Job experience appears to have some impact on engagement in RP as shown in Figure 1; newly employed radiographers (fresh graduates) engaged most in RP, which to disagree with 'engagement in RP tends to slightly increase with job experience'.<sup>[9]</sup> In this study the results suggest that engagement in RP decreased with

job experience, remained constant for some time (i.e. reached a plateau before it began to decrease once more). We were unable to establish any reason behind this rather unusual trend. We are inclined to agree with the notion that 'dynamism in education / training' may have a greater impact on engagement in RP than job experience.<sup>[9]</sup> In view of the small sample of radiographers studied, we concede that this phenomenon needs to be investigated further.

A limitation of this study is that the sample (n=50) is not representative of a large country like Nigeria. For this reason, the findings need to be interpreted within this context. Apart from Lagos, the Enugu

Metropolis has one of the largest concentrations of radiographers in the country. Moreover, we did not compare engagement in theory-practice dichotomy among male and female radiographers. In this study the male/female ratio was not equal thus we felt that could bias the results. To the best of our knowledge, however, the present study appears to be the only one to have attempted a long term follow-up evaluation of the outcomes of radiography education/training in the country.

### Conclusion

Engagement in RP by radiographers in Enugu metropolis was very high during the period studied. Radiography curricula and

teaching methods appear to have largely been effective. Job experience appears to have had very little effect on engagement in RP by radiographers in this study.

### Conflict of interest

None

### Contributions of all authors

Chareles UE conceptualised the study. He also edited the manuscript severally in order to reduce errors. Cletus UE reviewed literature and was in charge of data analysis. He also wrote the manuscript. HI was involved in data collection and also helped in some aspects of data analysis.

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