

peer reviewed ORIGINAL ARTICLE

## Challenges of training and clinical skill acquisition in radiography education: perceptions of students in resource-poor southeastern Nigeria

CC Ohagwu<sup>1</sup> BSc, MSc, PhD (UNN) | K Ochie<sup>2</sup> DCR (Lond), PGD, MSc, PhD (UNN) | CU Eze<sup>3</sup> BSc, MSc (UNN), MHPM (UNIBEN) | JC Eze<sup>1</sup> BSc, MSc, PhD (UNN) | EE Ezugwu<sup>1</sup> BSc, MSc (UNN) | M Barde<sup>4</sup> BSc (UNIMAID) | JK Umeano<sup>1</sup> BSc (NAU)

<sup>1</sup>Department of Radiography and Radiological Sciences, Nnamdi Azikiwe University Nnewi Campus, Anambra State, Nigeria.

<sup>2</sup>Department of Radiography and Radiological Sciences, University of Nigeria Campus, Enugu State, Nigeria.

<sup>3</sup>Department of Radiation Biology, Radiotherapy, Radiodiagnosis and Radiography, College of Medicine, University of Lagos, Nigeria.

<sup>4</sup>Department of Radiography, Bayero University, Kano, Kano State, Nigeria.

### Abstract

**Purpose:** To investigate the factors that contribute to the challenges of training and clinical skill acquisition in undergraduate radiography education in southeastern Nigeria.

**Methods:** A cross-sectional prospective study, which targeted radiography undergraduates in the clinical classes in two universities in southeastern Nigeria, was conducted. A 23-item self-completion questionnaire, designed in line with the objectives of the study, was used for data collection.

**Results:** The majority of the factors identified were strongly rated to contribute to the challenges of training except for unavailability of published programme curriculum. Multinomial logistic regression showed that the age of the students did not influence the rating of factors ( $p > 0.05$ ). Gender influenced the rating of high academic workload and tight scheduling of lectures and published programme curriculum is not interest-stimulating enough ( $p = 0.008$ ). The factor's rating by the males was higher than the females ( $3.23 \pm 0.91$  vs  $3.00 \pm 0.86$ ). The institutions, where the students are domiciled, influenced their ratings of congested and not conducive classrooms ( $p < 0.0001$ ), and shortage of ICT facilities and e-learning packages ( $p = 0.009$ ). The students' level of study influenced the rating of 7 of the 18 factors investigated.

**Conclusion:** The challenges facing training and clinical skill acquisition of radiographers in southeastern Nigeria have been highlighted in this study. The challenges identified include inadequate infrastructure, difficult logistics, inadequate teaching aids, negative attitudes of trainers, and poor training methods.

### Keywords

training; clinical skill acquisition; challenges; radiography

### Introduction

High quality training of a radiography student is desirable for the delivery of optimal radiological services and patient care. During training, students acquire theoretical academic knowledge, clinical skills and the professional behaviour expected of radiographers. In clinical training, time is devoted to ensuring gaining of sufficient clinical skills to enable students to become competent radiographers upon graduation.

A clinical skill is any specialised action of a healthcare worker in care of a patient that affects the clinical outcome.<sup>[1]</sup> Radiography students, like students in other health disciplines, acquire clinical skills through formal instructions and practice. In Nigeria, clinical skill acquisition in radiography begins in the third year of study in a five-year programme. It enables students to learn skills necessary to become competent radiographers. Training is a term used to describe the transformation

process from novice to expert radiographer, and begins in the first year of study. It includes theoretical classroom learning, simulations in the skills laboratories, and hospital-based practice under the guidance of clinical tutors. Radiography clinical tutors act as preceptors to students and play a very important role in training.

The southeastern Nigeria university training is faced with numerous challenges which could negatively affect the competence of student radiographers who graduate from the programme. This study aimed at investigating the factors that contribute to the challenges students face in training and clinical skill acquisition in undergraduate radiography education in southeastern Nigeria.

### Subjects and methods

A cross-sectional prospective study, which targeted radiography undergraduates who had commenced their clinical posting, was conducted. The study design and pro-

cedure was approved by the Research Ethics Committee of Faculty of Health Sciences and Technology, Nnamdi Azikiwe University Nnewi campus.

The study was conducted among students at the University of Nigeria (UNN), Enugu campus, and the Nnamdi Azikiwe University (NAU), Nnewi campus. Both institutions offer academic programmes in radiography and radiological sciences at undergraduate and postgraduate levels. A sample of potential respondents was drawn from the population of students who had commenced clinical posting at both institutions using Yaro Yamane's formula<sup>[2]</sup> as below:

$$n = N \div N + 1e^2$$

Where;

$n$  = desired sample size;

$N$  = total number of students that have commenced hospital posting in both universities;

$e$  = the level of precision at 0.05 level of

significance; and  
 $1 = \text{constant}$ .

At the time of the study, a total of 468 students had commenced clinical posting in both universities. Substituting this number for  $N$  in the equation resulted in sample of 216 respondents, as indicated below.

$$n = 468 \div 468 + 1 \times 0.05^2 = 216$$

However, data were collected from 234 respondents to increase the precision of the study. The data collection instrument was a self-designed 23-item self-completion and semi-structured questionnaire designed in line with the objectives of the study. The main author designed the questionnaire. He identified the challenges using his clinical hospital-based experiences, and as a clinical tutor of students on clinical posting, for example. The questionnaire was critically reviewed and approved as being adequate for the study by the entire research team. The questionnaire sought demographic information, and data on challenges of training and clinical skill acquisition in radiography. The respondents' suggestions, on how the challenges could be reduced, were also sought.

A pilot study was conducted to test the reliability of the questionnaire. Ten students from each respective university ( $n=20$ ) were randomly chosen. Coded copies of the questionnaire were administered directly to them. Each code was tagged to a particular respondent. The completed piloted questionnaires were returned to the researchers. After a period of three weeks, the questionnaires were re-administered to the same respondents. A satisfactory Cronbach's Alpha of 0.81 was obtained before the data collection commenced. Permission to conduct the study was sought and obtained from the heads of departments of radiography in both universities before the study questionnaires were administered. Potential respondents were selected at random from the target population using a ballot system. Only students who expressed a willingness to participate in the study were administered with the questionnaire. One member of the study team, administered the questionnaire by direct issuance to the selected student sample and, collected them immediately post-completion.

### Data analysis

The data were analysed using the Statistical Package for Social Sciences (SPSS)

version 19.0 (SPSS Inc., Chicago, Illinois). Responses to items 5 to 22 on the questionnaire were assigned numerical values to indicate their magnitude and direction for objective quantitative analysis. Strongly disagree = 1, disagree = 2, agree = 3, and strongly agree = 4. Frequency distributions were obtained for items 1 to 3. Descriptive statistics, namely minimum, maximum, mean, and standard deviation, were obtained for items 4 to 22. The participants' suggestions on improvement of clinical training of radiography students were subjected to content analysis using suitable themes and reported in a frequency table. Multinomial logistic regression was used to analyse the effect of demographic variables on the ratings of the factors identified in terms of their contribution to challenges of training and clinical skill acquisition. Tests were two-tailed with statistical significance considered at  $p < 0.05$ .

### Results

A total of 234 undergraduate radiography students, who had commenced clinical postings participated in the study. Their ages ranged from 19 to 40 years (mean  $23.4 \pm 2.5$ ). Their demographics are shown in Table 1. Their ratings of the factors that contribute to challenges of training and clinical skill acquisition are shown in Table 2. The mean ratings for more than half of the factors were greater than 3.0 on a 4-point scale. The factor with the least

mean rating was unavailability of published programme curriculum. Its mean rating was  $2.25 \pm 0.92$ . The ratings for other factor show they were fairly strongly noticed by students as shown in Table 2. Table 3 shows the ratings of the factors contributing to challenges of training and clinical skill acquisition, according to gender and training institution. Table 4 shows the ratings of the factors that contribute to challenges of training and clinical skill acquisition, according to level of study of the participants.

Multinomial logistic regression shows that participants' age had no influence on the rating of the factors that contribute to challenges ( $p > 0.05$ ). Gender influenced the rating of high academic workload and tight scheduling of lectures, as well as published programme curriculum is not interest-stimulating enough ( $p = 0.008$ ) as shown in Table 5: males gave higher ratings than females ( $3.26 \pm 0.81$  vs  $3.22 \pm 0.92$  and  $3.23 \pm 0.91$  vs  $3.00 \pm 0.86$  as shown in Table 3). The training institutions where the students' trainings were domiciled significantly influenced their ratings of "congested and not conducive classrooms" ( $p < 0.0001$ ), "there is acute shortage of visual teaching aids" ( $p = 0.004$ ) and "shortage of ICT facilities and e-learning packages" ( $p = 0.009$ ) as shown in Table 5. Participants from Nnamdi Azikiwe University rated the factors higher than respondents from University of Nigeria ( $3.53 \pm 0.65$  vs  $2.56 \pm 0.98$  for "congested and

**Table 1. Demographic characteristics of the respondents in the study.**

CHARACTERISTICS	PERCENTAGE (FREQUENCY)
<b>GENDER</b>	
Male	60.3% (n=141)
Female	39.7% (n=93)
<b>Total</b>	<b>100% (n=234)</b>
<b>INSTITUTION</b>	
University of Nigeria (UNN)	74.8% (n=175)
Nnamdi Azikiwe University (NAU)	25.2% (n=59)
<b>Total</b>	<b>100% (n=234)</b>
<b>YEAR OF STUDY</b>	
Third	39.3% (n=92)
Fourth	24.4% (n=57)
Fifth	36.3% (n=85)
<b>Total</b>	<b>100 (n=234)</b>

**Table 2.** Respondents' rating of identified factors contributing to challenges of training and clinical skill acquisition (n = 234).

IDENTIFIED FACTOR	RATING		
	MINIMUM	MAXIMUM	MEAN ± SD
Congested and not conducive classrooms	1	4	2.80 ± 1.00
High academic workload and tight scheduling of lectures	1	4	3.24 ± 0.86
Published programme curriculum is not interest-stimulating enough	1	4	3.14 ± 0.90
Unavailability of published programme curriculum	1	4	2.25 ± 0.92
Lecturers are insensitive and inconsiderate, and do not mentor students	1	4	2.98 ± 0.92
Lecturers are indifferent to student's peculiar needs	1	4	2.63 ± 0.89
Radiographers in clinical training centres are not willing to mentor students	1	4	2.72 ± 0.90
There is acute shortage of visual teaching aids	1	4	3.35 ± 0.86
Shortage of (information communications technology) ICT facilities and e-learning packages	1	4	3.44 ± 0.88
There is acute shortage of up-to-date library stock	1	4	3.33 ± 0.81
Shortage equipment in the demonstration rooms	1	4	3.49 ± 0.77
Clinical teaching sessions have excessive number of students	1	4	3.44 ± 0.75
Clinical teaching sessions are usually too restricted in scope	1	4	3.01 ± 0.93
Thought-stimulating problem based learning methods of delivering training are not used	1	4	2.93 ± 0.86
Limited opportunities for inter-institutional collaboration in learning	1	4	3.44 ± 0.73
There is poor participation of other health professionals in academic teaching and clinical training of radiography students	1	4	3.37 ± 0.79
There is inadequate teaching of basic sciences	1	4	2.65 ± 1.00
Basic medical sciences do not adequately support clinical learning of radiography students	1	4	2.53 ± 1.06

not conducive classrooms",  $3.47 \pm 0.73$  vs  $3.31 \pm 0.90$  for "there is acute shortage of visual teaching aids" and  $3.73 \pm 0.69$  vs  $3.34 \pm 0.91$  for "shortage of ICT facilities and e-learning packages" as shown in Table 3). Participants' level of study significantly influenced their ratings of six factors that contribute to the challenges of training and clinical skills acquisition ( $p < 0.05$ ) as shown in Table 5. The factors were "congested and not conducive classrooms", "high academic workload and tight scheduling of lectures", and "lecturers are insensitive and inconsiderate, and do not mentor students". The other factors were "there is acute shortage of visual teaching aids", "radiographers in clinical training centres are not willing to mentor students", "clinical teaching sessions have an excessive number of students", and "thought-stimulating problem based learning methods of delivering training are not used".

The respondents overwhelmingly suggested "recruitment of adequate number of lecturers, clinical tutors and provision of adequate learning facilities" (98.1%;

$n = 231$ ) and "provision of adequate and up-to-date library stock, e-library, and collaboration with established foreign institutions" (96.6%;  $n = 226$ ) as ways of improving clinical training of radiography students as shown in Table 6. Other measures suggested were "reduction of class sizes to make clinical training more of hands-on activity than theoretical teaching" (73.1%;  $n = 171$ ), "continuous assessment of students' progress in learning new skills during clinical posting" (76.9%;  $n = 180$ ) and "more participation of other professionals vital to the teaching of radiographers such as radiologists and nurses" (44.02%;  $n = 103$ ).

### Discussion

Radiography is a profession characterised by demonstrable clinical skills in patient care and all imaging modalities in the radiography curriculum including diagnostic ultrasonography in some countries. Training in radiography is thus made up of two important components: theoretical academic learning and acquisition of clinical skills. The responsibilities of radiogra-

phers are continually increasing. In order to cope with these increasing responsibilities of modern day clinical imaging, a broad-based university education was introduced in the 1980s to replace the monotechnic-based diploma programme in Nigeria.

However, university training is faced with numerous challenges which, if left to continue may adversely affect the clinical competence of radiographers graduating from the programmes. This survey aimed at investigating the factors that contribute to challenges radiography students face in training and clinical skills acquisition in southeastern Nigeria, a region we consider resource-poor. Although Nigeria has rich potentials, it can be regarded as a resource-poor nation because resources are not optimally utilised to take care of basic societal needs including tertiary education. Budgetary spending on education in Nigeria is low and below the United Nations Educational and Cultural Organization (UNESCO) recommendation.<sup>[3]</sup> There are myriads of challenges facing university training of radiographers in southeast-

ern Nigeria; these challenges ultimately hamper the clinical skill acquisition and attainment of desired educational and career goals. The challenges are in the form of inadequate physical facilities and manpower, lack of cooperation from other relevant professionals such as radiologists and nurses, non-use of appropriate set-up for theoretical and clinical teaching and ill-motivated lecturers and clinical tutors.

The results this study indicate that the factors identified as contributors to the challenges training and clinical skills acquisition, which contributions we sought to investigate were highly rated by the respondents except "unavailability of published programme curriculum" which had a low rating. Despite all these challenges, anecdotal evidence suggests that large numbers of Nigeria-trained radiographers are continually being employed in developed countries such as United Kingdom, United States, Canada, Australia and New Zealand. In view of the shortage of radiographers, Nigeria-trained radiographers

who seek employment in the developed countries undergo retraining programmes to enable them to meet standards in those countries.

The results of this study indicate that the students broadly identified, as challenges, inadequate provision of physical facilities, difficult logistics, inadequate modern teaching aids and, problems associated with attitudes of lecturers, clinical tutors and methods of delivering training. Inadequate infrastructure such as classrooms and offices are serious problems confronting education at all levels in Nigeria. It is therefore not unexpected that radiography students have noted it as one of the challenges facing their training. The available classrooms and clinical teaching areas in hospitals are often crowded with an excessive number of students. This is as a result of the unregulated number of students admitted yearly. The poor infrastructure on campuses and teaching areas in Nigerian universities is a direct result of poor funding, way below the UNESCO

recommendation.<sup>[3]</sup> The findings of this study indicate that inadequate infrastructure was significantly less of a challenge to students from UNN than students from NAU. This may be because the institution is older and has more facilities. It has the foremost radiography department in the country and was the second university in Nigeria to offer a bachelor of science programme in medical radiography (<http://unmedcollege.org>).

Logistics put in place for the programme constitute serious impediments to education and training of radiographers. The number of lecturers and clinical tutors is inadequate to cope with the large number of students enrolled in the programme. Clinical tutors serve as preceptors for clinical teaching of radiography students. The preceptorship has proved to be a highly useful strategy for clinical education. It allows education to be individualised, links classroom knowledge to real patient management problems, and provides for role modeling as the student develops

**Table 3. Rating of factors contributing to challenges of training and clinical skills acquisition according to gender and training institution (n = 234).**

IDENTIFIED FACTOR	RATING (MEAN ± SD)			
	GENDER		TRAINING INSTITUTION	
	MALE	FEMALE	UNN	UNIZIK
Congested and not conducive classrooms	2.82 ± 0.97	2.77 ± 1.04	2.56 ± 0.98	3.53 ± 0.65
High academic workload and tight scheduling of lectures	3.26 ± 0.81	3.22 ± 0.92	3.19 ± 0.89	3.37 ± 0.74
Published programme curriculum is not interest-stimulating enough	3.23 ± 0.91	3.00 ± 0.86	3.15 ± 0.89	3.08 ± 0.93
Unavailability of published programme curriculum	2.27 ± 0.97	2.22 ± 0.85	2.19 ± 0.91	2.42 ± 0.95
Lecturers are insensitive and inconsiderate, and do not mentor students	2.97 ± 0.95	3.00 ± 0.87	2.93 ± 0.94	3.14 ± 0.82
Lecturers are indifferent to student's peculiar needs	2.55 ± 0.91	2.75 ± 0.84	2.59 ± 0.87	2.76 ± 0.95
Radiographers in clinical training centres are not willing to mentor students	2.67 ± 0.91	2.80 ± 0.87	2.74 ± 0.89	2.68 ± 0.92
There is acute shortage of visual teaching aids	3.32 ± 0.91	3.41 ± 0.78	3.31 ± 0.90	3.47 ± 0.73
Shortage of ICT facilities and e-learning packages	3.41 ± 0.90	3.47 ± 0.84	3.34 ± 0.91	3.73 ± 0.69
There is acute shortage of up-to-date library stock	3.29 ± 0.88	3.40 ± 0.69	3.29 ± 0.83	3.46 ± 0.73
Shortage equipment in the demonstration rooms	3.48 ± 0.80	3.51 ± 0.72	3.50 ± 0.73	3.47 ± 0.86
Clinical teaching sessions have excessive number of students	3.43 ± 0.77	3.46 ± 0.72	3.42 ± 0.75	3.49 ± 0.73
Clinical teaching sessions are usually too restricted in scope	3.01 ± 0.93	3.01 ± 0.93	2.95 ± 0.93	3.19 ± 0.92
Thought-stimulating problem based learning methods of delivering training are not used	2.96 ± 0.89	2.89 ± 0.83	2.86 ± 0.88	3.15 ± 0.78
Limited opportunities for inter-institutional collaboration in learning	3.41 ± 0.75	3.47 ± 0.72	3.35 ± 0.77	3.68 ± 0.54
There is poor participation of other health professionals in academic teaching and clinical training of radiography students	3.35 ± 0.82	3.39 ± 0.74	3.33 ± 0.84	3.47 ± 0.60
There is inadequate teaching of basic sciences	2.61 ± 1.04	2.72 ± 0.95	2.58 ± 1.00	2.86 ± 1.00
Basic medical sciences do not adequately support clinical learning of radiography students	2.45 ± 1.07	2.65 ± 1.04	2.42 ± 1.10	2.85 ± 0.98



**Table 4.** Rating of factors contributing to challenges of training and clinical skills acquisition according to level of study (n = 234).

IDENTIFIED FACTOR	RATING (MEAN ± SD)		
	THIRD YEAR	FOURTH YEAR	FIFTH YEAR
Congested and not conducive classrooms	3.22 ± 0.80	2.39 ± 1.00	2.64 ± 1.04
High academic workload and tight scheduling of lectures	3.46 ± 0.72	3.21 ± 0.90	3.02 ± 0.91
Published programme curriculum is not interest-stimulating enough	3.03 ± 0.95	3.26 ± 0.81	3.16 ± 0.88
Unavailability of published programme curriculum	2.30 ± 0.93	2.37 ± 0.92	2.11 ± 0.90
Lecturers are insensitive and inconsiderate, and do not mentor students	3.07 ± 0.90	3.09 ± 0.76	2.82 ± 1.01
Lecturers are indifferent to student's peculiar needs	2.63 ± 0.96	2.68 ± 0.74	2.60 ± 0.92
Radiographers in clinical training centres are not willing to mentor students	2.93 ± 0.98	2.77 ± 0.87	2.46 ± 0.75
There is acute shortage of visual teaching aids	3.54 ± 0.67	3.32 ± 0.95	3.18 ± 0.94
Shortage of ICT facilities and e-learning packages	3.61 ± 0.69	3.37 ± 0.98	3.29 ± 0.96
There is acute shortage of up-to-date library stock	3.45 ± 0.70	3.21 ± 0.92	3.29 ± 0.83
Shortage equipment in the demonstration rooms	3.58 ± 0.68	3.44 ± 0.82	3.44 ± 0.81
Clinical teaching sessions have excessive number of students	3.42 ± 0.73	3.19 ± 0.83	3.62 ± 0.65
Clinical teaching sessions are usually too restricted in scope	3.02 ± 0.90	2.96 ± 0.94	3.04 ± 0.96
Thought-stimulating problem based learning methods of delivering training are not used	3.07 ± 0.82	2.84 ± 0.84	2.85 ± 0.91
Limited opportunities for inter-institutional collaboration in learning	3.54 ± 0.65	3.30 ± 0.82	3.41 ± 0.74
There is poor participation of other health professionals in academic teaching and clinical training of radiography students	3.27 ± 0.84	3.44 ± 0.78	3.42 ± 0.73
There is inadequate teaching of basic sciences	2.71 ± 1.02	2.68 ± 1.04	2.58 ± 0.97
Basic medical sciences do not adequately support clinical learning of radiography students	2.71 ± 1.03	2.32 ± 0.98	2.47 ± 1.11

standards and strategies for practice.<sup>[4]</sup> The lecturers are poorly paid compared to remunerations elsewhere; the clinical tutors are not paid honorarium by the training institutions. Most clinical tutors take part in the training of radiographers out of a desire to contribute to societal development. Another problem is that the lecturers are not specially trained to deliver education in radiography. Most lecturers do not mentor their students. This adversely impacts their progress in transforming from novice to expert radiographers. Although the lecturers, and some clinical tutors, possess postgraduate degrees in radiography and medical imaging they do not have any special training to be educators. This may be one of the reasons for poor attitudes towards the students they are supposed to mentor. Inadequate numbers of lecturers and clinical tutors, and poor remuneration ultimately lead to tight scheduling of lectures. They thus engage in other jobs to meet financial needs. A much talked about problem is poor participation of radiologists and nurses in teaching radiography students. The rivalry between different professional groups, which was exten-

sively discussed in Health Information For All (HIFA) by 2015, may be responsible for this negative attitude of other professional groups.<sup>[5]</sup>

Modern day education is driven by adequate provision of learning aids that students benefit immensely from. Facilities such as demonstration rooms, information communication technology, libraries and e-learning packages are often in short supply. Demonstrations rooms are important as students are taught the rudiments of imaging in a simulated environment before going to the hospital. Simulation-based learning (SBL) is now an accepted form of delivering medical education.<sup>[6-8]</sup> Also, results of a recent survey showed favourable perception of simulation-based learning among medical students in south India.<sup>[9]</sup> Since not all possible clinical situations can be encountered during training it is important that problem-based learning (PBL) is adopted for teaching radiography students. The clinical problems can always be simulated in the demonstration rooms if the trainers are given adequate training and appropriate equipment. Advantages of PBL include, inter alia, that

graduates fulfill the demands of industry and community by being able to adapt to change, communicate effectively, manage information and develop skills for self-directed as well as life-long learning; there is evidence that PBL contributes to the making of better health professionals.<sup>[10]</sup> The findings of the survey by Elsie et al.<sup>[10]</sup> showed positive attitude and perception of PBL by students and teachers of Makerere University, Uganda where PBL was adopted in teaching radiography undergraduates in 2003/2004 academic year.

The results of this study indicate that students find a disconnect between basic medical sciences, taught as foundation for radiography courses subsequent periods. The students identified inadequate teaching of these courses. They indicated the courses as not being supportive of their clinical training thus underscoring that the learning objectives of these courses appear not to have been achieved. Students thus experience difficulties in understanding clinical concepts at the time they are supposed to apply their knowledge of basic sciences.

**Table 5.** Multinomial regression table on influence of demographic characteristics on rating of factors contributing to challenges of training and clinical skills acquisition.

IDENTIFIED FACTOR	LEVEL OF INFLUENCE			
	AGE	GENDER	TRAINING INSTITUTION	LEVEL OF STUDY
Congested and not conducive classrooms	p = 0.617	p = 0.583	p < 0.0001*	p = 0.001*
High academic workload and tight scheduling of lectures	p = 0.603	p = 0.011*	p = 0.415	p < 0.0001*
Published programme curriculum is not interest-stimulating enough	p = 0.609	p = 0.008*	p = 0.762	p = 0.938
Unavailability of published programme curriculum	p = 0.664	p = 0.180	p = 0.123	p = 0.200
Lecturers are insensitive and inconsiderate, and do not mentor students	p = 0.803	p = 0.524	p = 0.213	p = 0.013*
Lecturers are indifferent to student's peculiar needs	p = 0.376	p = 0.252	p = 0.660	p = 0.224
Radiographers in clinical training centres are not willing to mentor students	p = 0.567	p = 0.471	p = 0.976	p = 0.001*
There is acute shortage of visual teaching aids	p = 0.266	p = 0.735	p = 0.004*	p = 0.002*
Shortage of ICT facilities and e-learning packages	p = 0.597	p = 0.971	p = 0.009*	p = 0.678
There is acute shortage of up-to-date library stock	p = 0.815	p = 0.307	p = 0.281	p = 0.614
Shortage equipment in the demonstration rooms	p = 0.648	p = 0.328	p = 0.395	p = 0.356
Clinical teaching sessions have excessive number of students	p = 0.087	p = 0.208	p = 0.393	p = 0.001*
Clinical teaching sessions are usually too restricted in scope	p = 0.168	p = 0.938	p = 0.088	p = 0.198
Thought-stimulating problem based learning methods of delivering training are not used	p = 0.869	p = 0.616	p = 0.188	p = 0.031*
Limited opportunities for inter-institutional collaboration in learning	p = 0.654	p = 0.555	p = 0.102	p = 0.383
There is poor participation of other health professionals in academic teaching and clinical training of radiography students	p = 0.062	p = 0.665	p = 0.053	p = 0.549
There is inadequate teaching of basic sciences	p = 0.373	p = 0.514	p = 0.180	p = 0.992
Basic medical sciences do not adequately support clinical learning of radiography students	p = 0.480	p = 0.512	p = 0.101	p = 0.093

Sociodemographic factors, namely training institution where the programme is domiciled and level of study showed differences in some of the challenges identified. Training institution could have an effect because of peculiarities of both institutions surveyed. The University of Nigeria is an older and bigger institution and may be better equipped with facilities for training of radiographers than the Nnamdi Azikiwe University. As training progresses those students who are not coping drop out, with the result that class numbers reduce. This then leads to improved lecturer-students ratio.

The respondents in this study suggested preferred solutions for tackling these challenges. An overwhelming majority of them suggested recruitment of adequate numbers of lecturers and clinical tutors, provision of adequate learning facilities, reduction of class sizes to make clinical training more of hands-on activity than theoretical teaching, provision of adequate

**Table 6.** Suggestions of respondents on improvement of clinical training of radiography students.

SUGGESTION	PERCENTAGE OF PARTICIPANTS (FREQUENCY)
Recruitment of adequate number of lecturers, clinical tutors and provision of adequate learning facilities	98.1% (n = 231)
Reduction of class sizes to make clinical training more of hands-on activity than theoretical teaching	73.1% (n = 171)
Provision of adequate and up-to-date library stock, e-library, and collaboration with established foreign institutions	96.6% (n = 226)
Continuous assessment of students' progress in learning new skills during clinical posting	76.9% (n = 180)
More participation of other professionals vital to teaching of radiographers such as radiologists and nurses	44.02% (n = 103)

and up-to-date library stock, e-library, and collaboration with established foreign institutions among others. While these suggested measures may not address all the challenges we think that they will go a long way to reducing their negative impact on training of student radiographers.

There were limitations in the study. First, the survey was conducted among stu-

dents of two universities in southeastern Nigeria and it may be erroneous to generalise to other universities training radiographers at undergraduate level. The researchers recommend that a nationwide survey of lecturers and students at all universities training radiographers should be conducted. Second, the data collection instrument was a self-completion questionnaire, which may have exposed the

survey to the flaws of self-reports. It is quite possible that some respondents may have given us exaggerated responses. An observation is a good way of overcoming this problem. Third, the wording of a questionnaire gives rise to the possibility of the questions eliciting biased responses. It is a drawback of questionnaire surveys. This should be taken into consideration regarding the results of this study.

### Conclusion

The study identified myriads of challenges facing academic training and clinical skill acquisition of radiographers in southeastern Nigeria. The challenges identified include inadequate provision of physical facilities, difficult logistics, inadequate modern teaching aids and, problems associated with attitudes of lecturers, clinical tutors and methods of delivering training.

### Conflict of Interest

None to declare by any of the authors.

### References

1. The SHA Workforce and Education Team. Yorkshire and the Humber clinical skills and simulation strategy, 2010. [Internet]. Available at [www.yh.hee.nhs.uk](http://www.yh.hee.nhs.uk). (Accessed on 24/07/2015).
2. Uzoagulu AE. Practical guide to writing research project reports in tertiary institutions (New edition). Enugu: Cheston Nigeria Limited. 2011,pp. 57-58.
3. Jaiyeoba SV. Human Capital Investment and Economic Growth in Nigeria. *African Research Review* 2015; 9 (1): Serial No. 36: 30-46. DOI: <http://dx.doi.org/10.4314/afrrrev.v9i1.4>
4. Burns C., Beauchense M., Ryan-Krause P., Sawin K. Mastering the preceptor role: challenges of clinical teaching. *J Pediatr Health Care* 2006; 20: 172-183. DOI: 10.1016/j.pedhc.2005.10.012
5. <http://www.hifa2015.org>. Q2: What have been the notable failures in human resources for health over the past 10 years? [Internet]. (Accessed 20th August, 2015).
6. Rosenthal ME., Ritter EM., Goova MT., Castellvi AO., Tesfay ST., Pimentel EA., Hartzler R., Scott DJ. Proficiency-based fundamentals of laparoscopic surgery skills training results in durable performance improvement and a uniform certification pass rate. *Surg Endosc* 2010; 24:2453-7. DOI: 10.1007/s00464-010-0985-2.
7. Bogossian F, McKenna L, Higgins M, Benefer C., Brady S., Fox-Young S., Cooper S. Simulation based learning in Australian midwifery curricula: Results of a national electronic survey. *Women and Birth* 2012; 25: 86-97. DOI: 10.1016/j.wombi.2011.02.001.
8. Watson K., Wright A., Morris N., McMeeken J., Rivett D., Blackstock F., Jones A., Haines T., O'Connor V., Watson G., Peterson R., Jull G. Can simulation replace part of clinical time? Two parallel randomised controlled trials. *Med Educ* 2012; 46: 657-67. DOI: 10.1111/j.1365-2923.2012.04295.x.
9. Joseph N., Nelliyanil M., Jindal S., Utkarsha Abraham AE., Alok Y., Srivastava N., Lankeshwar S. Perception of simulation-based learning among students in south India. *Ann Med Health Sci Res* 2015; 5: 247-252. DOI: 10.4103/2141-9248.160186
10. Elsie KM., Francis B., Gonzaga MA. Attitudes and perceptions of students and teachers about problem based learning in the radiography curriculum at Makerere University, Uganda. *European Journal of Radiography* 2009; 1: 156-162. DOI: 10.1016/j.ejradi.2010.05.001.

