Programme Evaluation as a tool to engender innovative ultrasound practice: a study of the postgraduate programme in medical ultrasound of the Institute of Radiography, Nigeria.

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Abstract

Background: Current changes in modalities, clinical standards and scope of practice make it imperative for education/training programmes in ultrasound to be evaluated periodically to make them innovative and effective. This study evaluated the postgraduate diploma programme in ultrasound (PGDUS) of the Institute of Radiography to ascertain whether it has met its objective of producing knowledgeable and innovative sonographers.

Methods: Semi-structured questionnaire was used to survey a convenience sample of 100 radiographers who had undergone the programme while descriptive statistics were used in data analysis.

Results: Only 100 radiographers have completed the programme since its inception; 70% of PGDUS certificate holders who are employed in government hospitals do not perform ultrasound examinations but ≈ 100% of those employed in private hospitals do. Approximately 4% of PGDUS certificate holders has received financial uplift; ≈ 100% of participants were satisfied with the didactic aspect of their training but were less satisfied with hands-on-training.

Conclusion: While it has improved knowledge about ultrasound principles in the majority of participants, the impact of PGDUS programme of the Institute of Radiography on bridging the manpower gap in ultrasonography practice in Nigeria is quite marginal. The certificate obtained after undergoing the programme has not been accepted in most public health institutions in Nigeria neither has it so far been accepted as academic qualification.

Keywords: Ultrasound, Education/training, Programme evaluation; Innovation; Radiography

Introduction

Educational programme evaluation is the systematic appraisal of the quality of teaching and learning which is carried to identify strengths and weaknesses of the programme [1]. Educational programme evaluation plays a formative role by identifying areas where teaching needs to be improved upon, or a summative role by judging the effectiveness of teaching methods [2]. Evaluation of education activities is usually done to provide curriculum planners information about the needs of the target group (needs assessment), the delivery of the programme (process evaluation) as well as determining the extent to which the education activity has met its intended aims (summative evaluation). It helps the educator to gauge the impact of the programme and provides him/her the basis for adjustments where and when necessary in order to ensure continued effectiveness of the programme [3].

The ministry of education is responsible for education while the ministry of health is responsible for the training of all healthcare professionals in Nigeria. Postgraduate (PG) education/training supports the continuing professional development of healthcare professionals [4]. The rationale for a postgraduate medical programme is essentially to support health professionals, especially in their early years of practice, to enable them to access development opportunities within a supportive system; it is designed to encourage the development of a range of theoretical and practical leadership skills necessary to thrive in a constantly changing, increasingly complex healthcare system [5]. It equally helps participants to be better able to provide effective and efficient services, enhancing care for patients and safeguarding their own wellbeing [4]. The thrust of most PG medical programmes is to engender professional and

practice development, using reflective learning techniques for a period not less than 12 months but often not more than 18 months. It is made up of modules accredited by a university and taught by well-trained educators. At the end of training, participants are required to submit a project work and a logbook detailing his/her practical training experience during the programme. This method allows participants to identify a current problem, design a research protocol, carry out the research (usually under supervision, though) and by so doing, he/she is afforded the opportunity to review and justify their work in an academically rigorous way [5].

Clinical ultrasound practice is evolving with advance in technology. The near constant evolution of ultrasound as an imaging modality places a burden on ultrasound teaching/training programme planners to come up with innovative teaching/training method that will produce competent ultrasound practitioners (radiographers/sonographers). In addition to several universities that offer PG education/training for sonographers in Nigeria, the Institute of Radiography (IoR) which is an arm of the Radiographers' Registration Board of Nigeria (RRBN) offers a PG diploma programme in ultrasound (PGDUS). The programme took off in 2004 with the aim of ameliorating the manpower shortage in sonography across the country. In addition to this, the PGDUS programme was established to produce competent sonographers with sound theoretical, practical and ethical knowledge needed in sonography practice [4].

Periodic evaluation of educational programmes is essential [2]. The need for evaluation of the level of training as well as the quality of sonography practice has been highlighted by several researchers [6,7]. In spite of this, the PGDUS programme has not been evaluated to determine achievements recorded, identify attractors and detractors in order to proffer ways to improve the programme's effectiveness. The present study was, therefore, carried out to evaluate the quality of teaching and learning as well as to identify attractors and detractors of the PGDUS programme.

Methods

The descriptive study was carried out within 6 weeks from March to August, 2018 using a non-experimental research design. The 'stake holder oriented approach' was used to evaluate the PGDUS programme [8]. Consequently, eligible participants were radiographers who registered for the PGDUS programme since its inception but only those who completed it were included in the study. From the pool of eligible participants, a convenience sample of 100 participants was recruited. Before the study commenced, approval to conduct the study was sought and obtained from the Institutional Review Board (IRB) at Yaba Lagos. Permission was equally obtained from the RRBN management before the study commenced. Participants were identified using their records at RRBN and were contacted using phone calls. Verbal consent was obtained from each participant before he/she was recruited.

Data collection: A semi-structured questionnaire designed using Student Assessment of their Learning Gains [SALG] guideline [9] was used to obtain information from participants. Participants were visited at their places of work and the questionnaire was administered and retrieved the same day by one of the researchers or by a trained assistant.

Data Analysis: As was recommended in a similar study [10], Likert's scale was used to gauge responses. Participants were sorted in line with their response to specific questions posed. Proportion of sonographers who admitted and of those who did not admit that the programme improved their knowledge, competence, professionalism and etiquette were computed. Proportions were computed for participants who perform sonographic examination in private and public hospitals, those whose bargaining power increased/were promoted, and those who have used the PGDUS certificate to gain admission into a tertiary institution. Proportions were compared using Chi square and differences were considered statistically significant if they were <0.05.

Results: Since its inception in 2004, only 413 radiographers have enrolled into the PGDUS ultrasound programme while 252 participants (60.5%) completed the programme. The mean of enrollees from 2004 to 2018 is 59 candidates but enrollment rose sharply between 2017 and

2018 (figure 1). More men than women have enrolled into the programme while majority of enrollees were within the 31-35 years age range (table 1); more radiographers in private practice (82%) have completed the programme and more participants from the private sector (94%) were allowed to perform sonographic examinations after completing the programme (table 2). The PGDUS certificate is readily accepted/ recognized by the Lagos State Ministry of Health (LMOH), partially accepted/recognized by the Federal Ministry of Health (FMOH) but currently not accepted/recognized by the Ministry of Education (MOE; table 3).

Most participants were of the view that the PGDUS programme improved their knowledge of basic principles of Sonography (figure 2); the programme has equally improved participants' understanding of professional/ethical issues in sonography practice (figure 3). Majority of participants were satisfied with the quality of lectures/caliber of lecturers, content of modules and the condition of the teaching environment (table 4) but majority of participants were not satisfied with the practical (hands-on) training aspect of the programme (figure 4). Most participants who completed the programme (≥ 80%) are convinced that they can confidently write a standard ultrasound report (figure 5). The PGDUC certificate has significantly improved the bargaining power of sonographers in the private sector; this was not so in government hospitals. The PGDUS certificate has so far conferred little advantage on sonographers who attempted using it for admission into Nigerian universities for higher education (table 5). High tuition and logistic challenge are major detractors to enrolment into the PGDUS programme (table 6).

Table 1: Distribution of participants according to their gender and age

Gender distribution			
Gender	**N**	**Percentage (%)**	**P value**
Male	57	57	
Female	43	43	0.823
Total		**100**	

Age distribution		
Age range (years)	**N**	**Percentage (%)**
26-30	17	17
31-35	39	39
36-40	15	15
41-45	19	19
46-50	7	7
51-55	3	3
Total		**100**

Table 2: Distribution of participants according to workplace and permission to scan

Work place	**Frequency (N)**	**Percentage (%)**	**P value**
Private	82	82	
Public (government owned)	18	18	0.0032
Total	**100**	**100**	
Permitted to perform ultrasound examination after obtaining PGDUS certificate			
Private	94	94	0.0021
Public	6	6	

Table 3: Recognition of the PGDUS certificate by government agency/ministry in Nigeria

Agency/ministry	Frequency (N)	Percentage (%)
LASG	65	65
FMOH	34	34
FMOE	1	1
Total		**100**

LASG = Lagos state government; FMOH = Federal ministry of health; FMOE = Federal ministry of education

Table 4: Distribution of responses on the effect of the PGDUS certificate on earning/bargaining power and promotion

Assessor	Participants from the private sector		Participants from the Public sector	
	Response			
	Yes	No	Yes	No
Did the programme improve your earning/bargaining power?	58(71%)	24(29%)	15 (83%)	3(17%)
Have you been promoted based on the PGDUS certificate?	38(46%)	44(54%)	0(%)	18(100%)
Have you used the PGDUS certificate to gain admission into a university?	0(0%)	82(100%)	0(0%)	18(100%)

Table 5: Participant's assessment of lecturers, module content and lecture environment

	Agree	Disagree	P value
Did lectures demonstrate adequate knowledge of sonography?	70(70%)	30(30%)	
Did lecturers lay emphasis on the need for sonographers to adhere to international best practices during practice?	75(75%)	25(25%)	>0.05
Were lectures adequate; were modules rich in content and lecture periods adequate?	79(79%)	21(21%)	
Were lecture halls conducive; do you like it that examination only comes at the end of the programme?	80(80%)	20(20%)	

Table 6: Detractors to enrolment into the PGDUS programme

	Response	
Detractors	**Agree**	**Disagree**
Long distance from place of work to lecture venue is a major obstacle to enrollment into the programme	93 (93%)	7(7%)
Tuition is too high and more participants will enroll into the programme if they get sponsorship from their employers	83 (83%)	17 (17%)
Lecture periods coincide with official working hours and most senior colleagues are not willing to assist	87 (87%)	13(13%)
Uncertainty over the usefulness of the PGDUS certificate is major obstacle	53(53%)	47(47%)

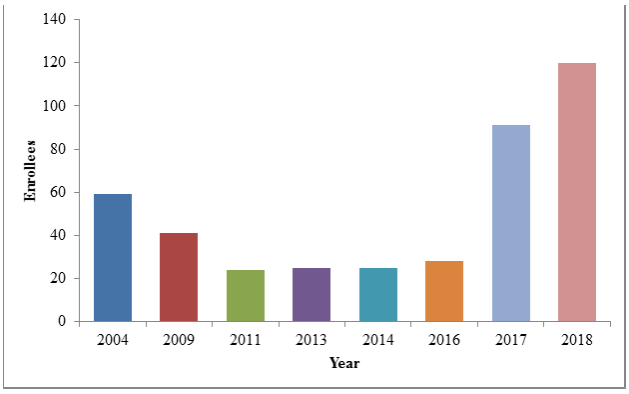

Figure 1: Bar charts showing that enrollment waned after inception of the PGDUS programme but waxed between 2017 and 2018.

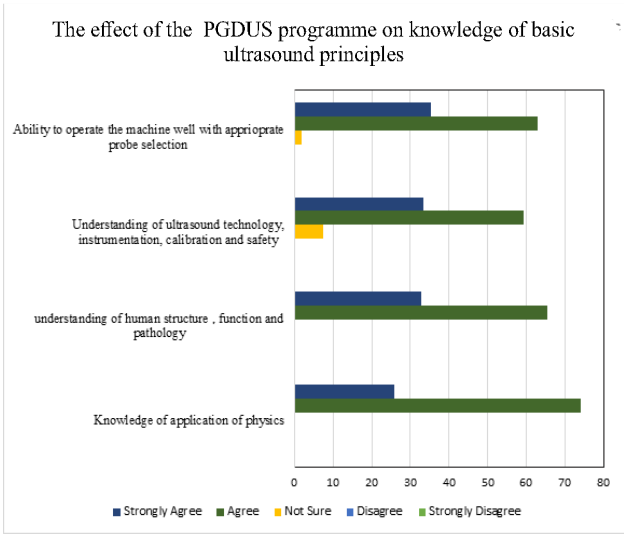

Figure 2: Bar charts showing that most respondents agreed that the PGDUS programme improved their knowledge of basic principles of Sonography

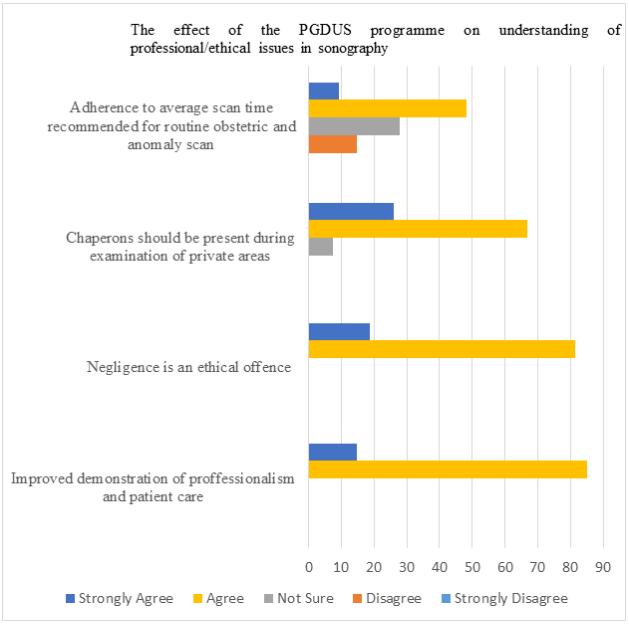

Figure 3: Bar charts showing that the PGDUS has improved the understanding of professional/ethical issues in sonography among the majority of participants

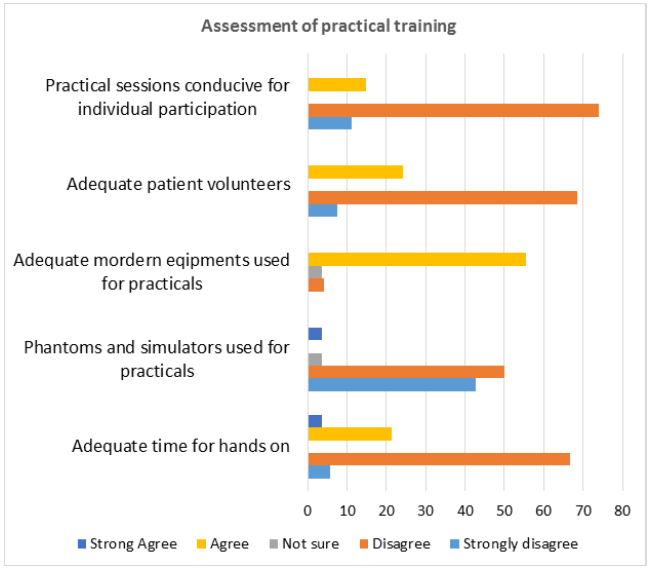

Figure 4: Bar charts showing that majority of candidates were not satisfied with practical training aspect of the programme.

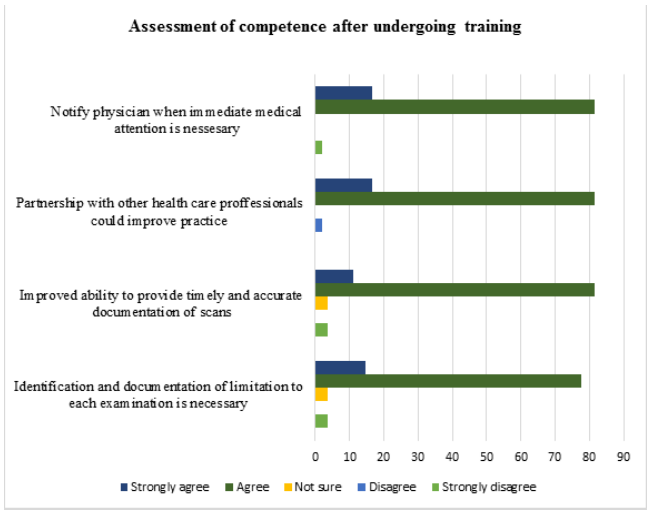

Figure 5: Bar chart showing that most participants who completed the programme can confidently write a standard ultrasound report.

Discussion

In the maiden post-inception evaluation, the rate of abandonment (39.5%) of the PGDUS programme of the Institute of Radiography (IoR) was found to be quite high. This high rate of abandonment of the programme suggests that a significant number of enrollees found it difficult to continue the programme after successful registration. It was discovered that radiographers' attitude to enrollment into the programme was more or less lukewarm in the first decade but appears to have gained momentum between 2017 and 2018. This

assertion is buttressed by the fact that the mean enrollees for the 2004 to 2016 and 2017 to 2018 periods is 59 and 105 candidates, respectively. The geometric increase in enrollment is largely due to a slight reduction in tuition fees and decentralization of the programme that started in 2017. This supports the opinion of Eze *et al* [11] who had earlier reported that paucity of fund hindered most radiographers in Edo and Lagos states from engaging in PG education.

When the number of male and female enrollees was compared, no statistically significant difference ($p > 0.05$) was found. This implies that male and female radiographers seem to have shown almost equal interest in the PGDUS programme. This is at variance with the opinion earlier canvassed by Eze *et al* that 'significantly more male than female radiographers in Edo and Lagos states sought to enroll in PG programmes'[11]. This is not surprising because it has been reported that radiography students of both sexes prefer ultrasonography to other medical imaging sub-specialties[12]. When the age of participants was considered, a sharp decline in enrolment was found as participants approached the 5th decade of life. This result is similar to the age range reported by Ugwu et al in a study carried out to determine attitudes and barriers to post graduate education among radiographers in South Eastern Nigeria [13]. Since a majority of radiographers in Nigeria graduate from the university and settle for job before their 30th birthday, 31-35 years being the peak age range of enrollees in the present study suggests that most participants have probably worked for a period ≥ 5 years after graduation before enrollment. It must, however, be submitted that this assertion may not be true for every participant since the exact year of graduation before enrollment into account was not established.

The PGDUS programme has so far been significantly more popular among radiographers in the private sector. This probably means that more radiographers in private hospitals latched onto the PGDUS programme to enhance their proficiency and bargaining power. In fact, most radiographers/sonographers in the private sector admitted that the certificate boosted their earning/bargaining power. Rather surprising, it was observed that the PGDUS certificate is well recognized and accepted by Lagos State Government (LASG) as most respondents said that the certificate is recognized by HEFAMA which is an agency of Lagos state government responsible for quality assurance in healthcare services in the state. It is a surprise that the certificate is only partially recognized by the Federal Ministry of Health (FMOH) because RRBN is a parastatal under the FMOH. The fact the PGDUS certificate has so not been recognized by FMOH is a surprise because radiographers who work in most federal government-owned hospitals/medical centers said that they have not been promoted nor permitted to perform ultrasound examination of patients after acquiring the PGDUS certificate. It was equally observed that the Federal Ministry of Education (FMOE) appears not to have recognized the PGDUS as an academic qualification as no respondent have used it either solely or as added advantage to gain admission into any tertiary institution in Nigeria so far. This implies that the PGDUS programme appears to have, at best, merely served as an elongated period of continuous professional development (CPD).

The PGDUS programme of the IoR seems to have largely succeeded in producing confident, knowledgeable/competent ultrasound practitioners. This view point is based on the fact that most participants said that their knowledge of basic principles of sonography got improved after successful participation in the programme. Ipso facto, it is suggested that the PGDUS programme has largely satisfied a life-long learning objective which, according to the CPD News Team, is that 'learning must bring with it an increase in confidence and resulting abilities, all of which correlate to an improvement of capability for their employment environment'[14]. It is thus pertinent to point out here that while the programme seems to have impacted positively on a very key objective of extended specialty training which Agius *et al* described as the 'ability to understand and conform with professionalism and ethical standards of practice[5], a significant proportion of participants (28%) said that they did not understand standard procedures for routine and anomaly ultrasound examination. For instance, this category of participants did not know that there is a minimum scanning period of time for routine and anomaly scan (15 and 30 minutes, respectively) which every sonographer is obliged

to adhere to during practice. Furthermore, about 8% did not understand the importance of the presence of chaperons during sonographic examination of a patient of the opposite gender. All these imply that the modules were not all encompassing or that lecturers did not give much emphasis on them. In fact, a significant proportion of respondents expressed the view that some lecturers were not knowledgeable and that some did not adequately emphasize the need for sonographers to adhere to international best practices when performing sonographic examinations. Moreover, a significant proportion of participants who were dissatisfied with the number and duration of lectures were equally dissatisfied with arrangement of the lecture hall. Furthermore, majority of candidates were not satisfied with the practical training aspect of the programme with most them saying that summative method of assessment of enrolees did not bode well with them. These expressions of dissatisfaction expressed by participants surveyed seem to suggest that the PGDUS programme needs to be modified to make it more effective.

Impediments to enrolment into the PGDUS programme as listed by participants in the present study are lack of fund, logistic problem, congested/conflicting job schedule and unsupportive attitude of senior colleagues at their respective place work. These detractors are similar to what has been reported as impediments to engagement in PG education by radiographers in some states in Nigeria [8]. This study equally revealed that formal classroom type of training and inability of PGDUS certificate holders to get any mileage at their work places in terms of recognition/promotion appear to be major disincentives to enrolment. All this supports the previous assertion that the PGDUS programme appears to need readjustment to make it more effective.

In this maiden post inception evaluation of the PGDUS programme of the IoR, some radiographers/sonographers who completed the programme but who are now living abroad were not recruited. The inclusion of PGDUS certificate holders who are now living overseas in the study would have enriched this study the more. A document detailing the core objectives set by the initiators of the PGDUS programme was not available hence there is a need for further studies to empirically determine whether objectives set at the inception of the PGDUS programme have or have not been met.

Conclusion

Post inception evaluation can, therefore, be used to highlight major achievements, failures, attractors and detractors to enrolment into the postgraduate diploma in ultrasound (PGDUS) programme of the Institute of Radiography and thus engender innovation in sonography education and practice. The PGDUS programme of the Institute of Radiography (IoR) appears to have impacted marginally on the dearth of trained sonographers in Nigeria since its inception in 2004. While PGDUS certificate holders appear to have confidence in their ability as sonographers, the diploma awarded after the programme seems to have so served merely as a trade rather than academic certificate at the moment. Decentralization of the programme to different zones in the country, the use of phantoms and Mannequins to enhance practical training and laying less emphasis on end-of-programme summative examination are major attractors to enrolment into the programme. Laying too much emphasis on didactic learning, high tuition, logistic problems and uncertainty concerning the recognition/acceptance of PGDUS certificate are major detractors to enrolment into the PGDUS programme.

Conflict of interest: Nil

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