CLINICIANS' PERCEIVED COMPETENCE AND SELF REPORTED CONFIDENCE IN ULTRASOUND SKILLS AMONG PRACTICING RADIOGRAPHERS IN NIGERIA

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ABSTRACT

AIM: To investigate clinicians' perception of Radiographers' competence in ultrasound practice and the self-reported confidence in ultrasound practice among radiographers.

METHOD: Using a 5-Point Scale, Seventy-Six out of one hundred clinicians from different specialties responded to a questionnaire designed to assess clinicians' perception of Radiographer ultrasound skills. From 75 Radiographers, 54 responses were received to questions addressing self reported confidence among this category of professionals. The information was extracted and reviewed by experts. A content analysis was conducted to find a way of further improvement. The independent sample T test was carried out to determine the difference between clinicians perceived competence and the reported confidence of radiographers.

RESULTS: Results showed that radiographers recorded a mean score 3.62 ± 0.76 on assessing their confidence, while clinicians perceived them as competent with a mean score of 2.92 ± 0.50. The responses indicate that radiographers carry out ultrasound roles with a reasonable level of confidence and are perceived as fairly competent by referring clinicians.

CONCLUSION: Radiographers Ultrasound Skills are rated above average (2.92/5.0) by clinicians, while the radiographers rate their confidence at 3.62 over 5.0 or good Content analysis recommend ways of further improving radiographer skills in ultrasound practice.

Key Words: competence, confidence, skills, ultrasound, practice.

INTRODUCTION

Diagnostic Ultrasound is a rapidly developing imaging technology which is widely used in both industrialized and developing countries. Since its introduction in the 1960s, ultrasound has found widespread application in anatomical imaging, blood flow measurement and evaluation of physiology in almost all aspects of medicine1. In Nigeria / Africa sub regions, ultrasound use has become an accepted medical procedure with the usage of the equipment becoming increasingly popular among a wide variety of physicians[2].

Ultrasound imaging technique has replaced and complemented a large number of radiographic and nuclear medicine procedures and has opened new areas of diagnostic investigation. In many cardiovascular diseases, diagnostic ultrasound has replaced invasive methods as the primary means of evaluation. In obstetrics where radiography is not generally used, diagnostic ultrasound has provided an important means of accessing fetal viability and age, evaluating fetal development, and diagnosing fetal, uterine and placental abnormalities. An author stated that the use of diagnostic ultrasound should be encouraged where there is likelihood of clinical benefit and discouraged in case for which no such benefit is expected[3].

There has not yet been any published report of harmful biological effects due to diagnostic ultrasound on either patients or staff[4]. As a result of this, obtaining maximum clinical benefit from diagnostic ultrasound as well as ensuring the optimal utilization of health care resources requires a combination of appropriate instrumentation and skills in both performance and interpretation of examinations[5].

Kawooya in his work stated that there is a global shortage of radiologist with Africa having the highest hit[6]. With the foregoing and the increasing wish for medical specialist other than radiologist to undertake ultrasound examinations, there has been a role extension of trained allied health professionals which include nurses, radiographers, and assistant physicians' e.t.c[7]. Role extension according to Kawooya is taking on new non-traditional necessary roles which entails re-evaluation, restructuring, retraining and redeployment[6].

Traditionally, medical ultrasonographic examinations have been performed collaboratively by both physicians or sonologist and non-physicians or sonographers. The technical component of the examination (production of images has been considered the responsibility of the sonographer) and the professional component (interpretation of images) has been the role of the sonologist[8]. The mode of gaining ultrasound reporting skills as well as knowledge among practicing radiographers is highly diverse involving both formal and informal education. Leslie and co-authors carried out a research to compare the accuracy of radiographers and radiologist in routine abdominal sonography[9].

One hundred patients for routine abdominal ultrasound examination were recruited for the study; each patient was examined by both radiographer and radiologist. Both operators noted their findings and wrote a concluding report without conferring. In forty four (44) cases, both operators reported examination as normal. In forty nine (49) cases both operators reported examination as abnormal, and there was complete agreement between operators. In seven cases there was complete agreement between operators. Three of these disagreements were considered minor and the other four major. In three of the seven cases the radiographer was correct and in four the sonologist was correct.

They concluded that experienced radiographers and radiologists are highly accurate in performing routine abdominal sonography.

Competence can be defined as possession and demonstration of knowledge skills and abilities to meet occupational standards of a profession[10]. This is important as radiographer plays a central role caring for the patient before, during and after the radiographic examination. It is of paramount importance that the radiographer is familiar with the problems involved and can support the patient during the radiographic procedure[11].

In line with this, Kawooya noted that if one was to train radiographers to carry out new roles like ultrasound and film interpreting, this must be to level of competence, thorough enough so as to provide the referring clinician with adequate information to influence therapy decisions[6]. Most sonographic features are non-specific and image interpretation process is observer dependent, making proper diagnosis to rest on the skills and expertise of the sonographer[12]. This study was designed to investigate the clinicians' perceived competence and self reported confidence in ultrasound skills among radiographers in South East Nigeria.

The current trend in radiography practice in Nigeria is role extension to ultrasonography. In some developed countries of the world there are trained individuals (sonographers) who assist the radiologist / physician in making ultrasound diagnosis. In Nigeria however, there is no separate training for sonographers. Trained radiographers combine radiography with sonography practice as an aspect of their role extension. Internet search revealed there has been no study to assess the self confidence of radiographers in ultrasound reporting as well as their competence as perceived by clinicians within this locality.

METHODOLOGY

Radiographers who are involved in ultrasound practice and clinicians who refer patients to radiographers for ultrasound investigation in south east of Nigeria were recruited for this study.

Inclusion criteria on the path of the radiographers were knowledge and full involvement in ultrasound practice. Clinicians who have received report from a radiographer were included in this study.

Self designed questionnaires with open and closed ended questions were given to Radiographers and clinicians who were conveniently selected. Two different kinds of questionnaires were distributed. One class was given to 75 radiographers and the other to 100 clinicians. Each class of the questionnaires sought for demographic information (such as age, gender; years of practice, qualifications and area of specialty) and competence as perceived by clinicians & confidence the radiographers have in their skills. The Likert scale (score of 1 to 5) was employed in the study.

Content analysis with questions exploring information of how to enhance radiographer competence and confidence was assumed. Inferential and descriptive statistics were done using SPSS version 16. $P < 0.05$ was used as level of significance.

RESULTS

A total of 54 out of 75 questionnaires were returned for the radiographers while 76 out of 100 questionnaires were returned for the clinicians.

The independent sample T test was carried out to determine the difference between clinicians perceived competence and the reported confidence of radiographers. Mean values ± standard deviation are 2.92 ± 0.50 and 3.62 ± 0.76 for clinicians and radiographers respectively. Statistical analysis showed no significant difference between the two scores ($p < 0.05$)

The demographic distributions of the two groups are given below.

Table 1: DEMOGRAPHIC DATA OF RADIOGRAPHERS

VARIABLES	MALES/ (PERCENTAGE %)	FEMALES/ (PERCENTAGE %)
SEX	47 (87)	7(13)
AGE RANGE(YEARS)		
20-30	21(38.9)	24(44.44)
31-40	18 (33.3)	20(37)
41-50	8(14.8)	10(18.5)
51-60	0	0
TOTAL	47(87)	7(13)
YEARS OF PRACTICE		
1-3	26(48.1)	3(5.6)
4-6	12(22.2)	2(3.7)
7-10	2(3.7)	1(1.8)
>10	7(13)	1(1.8)
TOTAL	47(87)	7(13)
EDU. QUALIFICATION		
DCR	1(1.8)	0
BSC	41(80)	5(9.2)
MSC	5(9.2)	2(3.7)
PhD	0	0
OTHERS	0	0
TOTAL	47(87)	7(13.0)

Table 2: DEMOGRAPHIC DATA OF CLINICIANS

VARIABLES	MALES/ (PERCENTAGE %)	FEMALES/ (PERCENTAGE %)
Sex	59(77.6)	17(22.4)
Age Range(Years)		
20-30	17(22.4)	3(3.9)
31-40	32(42.1)	9(11.8)
41-50	10(13.2)	5(6.6)
51-60	0	0
TOTAL	59(77.6)	17(22.4)
Years Of Practice		
2-5	31(40.8)	5(6.6)
6-9	16(21.1)	8(10.5)
>10	12(15.8)	4(5.3)
TOTAL	59(77.6)	17(22.4)
Area of specialization		
GP.	16(21.1)	7(9.2)
SURG.	15(19.6)	8(10.5)
O&G	24(31.5)	0
OTHERS	4(5.3)	2(2.6)
TOTAL	59(77.6)	17(22.4)

Table 3: Distribution of Radiographers' Perception on the Effect of Duration of Practice on Competence and Confidence.

RESPONSE	FREQUENCY	PERCENTAGE (%)
Strongly agree	39	72.2
Agree	15	27.8
Indifferent	0	0
Disagree	0	0
Total	54	100

Table 4: Frequency at which Radiographers' receive complaints about their reports.

RESPONSES	FREQUENCY	PERCENTAGE (%)
Nil	1	1.8
Always	1	1.8
Sometimes	10	18.5
Rarely	35	64.8
Not at all	7	13.6
TOTAL	54	100

Table 5: Distribution of how Radiographers Gained Ultrasound Skills

RESPONSES	FREQUENCY	PERCENTAGE (%)
Nil	1	1.8
Experience	15	27.8
personal reading	3	5.5
university course	2	3.7
post graduate training	13	24.1
experience, personal reading and post-graduate training	1	1.8
experience and personal reading	10	18.5
personal reading and post-graduate training	2	3.7
experience, personal reading and university course	4	7.4
personal reading and university course	1	1.8
experience, personal reading, university course and post-graduate training	1	1.8
experience and university course	1	1.8
Total	54	100

Table 6: Frequency distribution for rates at which clinicians received ultrasound reports from Radiographers

RESPONSES	FREQUENCY	PERCENTAGE (%)
Always	32	42.1
Sometimes	32	42.1
Rarely	10	13.2
not at all	2	2.6
Total	76	100

Table 7: Factors Influencing Patronage of Radiographers by Clinicians.

RESPONSES	FREQUENCY	PERCENTAGE(%)
Nil	4	5.3
years of practice	29	38.1
educational qualification	10	13.1
Others stated	17	22.4
both years of practice and educational qualification and also stated some other reason	3	3.9
both years of practice and educational qualification only	13	17.1
Total	76	100

CONTENT ANALYSIS

This study revealed that about 11 radiographers (20.37%) suggested that regular study, personal reading, constant training and practice will improve their skills. More than one-fifth (25.9% n=14) noted that attending refresher courses, seminars in ultrasound and workshops aids in improving ultrasound skill. Over a quarter (27.7% n=15) reported that good knowledge of anatomy, physiology and clinical pathology will improve accuracy of diagnosis, while about one-tenth (11.1% n=6) advocated that experiential practice should be given at undergraduate level. The remaining population listed other factors such as Radiographers' registration board of Nigeria (RRBN) should organize for professional development programmes in ultrasound, apprenticeship and good rapport under trained sonologist, and registration with international professional bodies such as American Institute of Ultrasound in Medicine (AIUM). It was also noted that strict follow up of reports is needed and should make use of appropriate and up-to-date equipments.

Twenty five percent of clinicians' stated that radiographers cooperation with radiologist is a key factor in improving their skills, 15.8% (n=12) said that radiographers should request for feedback from clinicians always. About 13% of the clinicians were of the opinion that seeking second opinion will go a long way in improving radiographers' skills. Adequate exposure and training before starting off private practice was the opinion of 7.8% (n= 6) clinicians. Approximately 15% clinicians (n=11) said that apprenticeship under well trained radiologist should be considered. Updating with current trend, attending update courses, reviewing scope of undergraduate training to attain high level of proficiency in clinical anatomy and pathology with sonography as an undergraduate course was the idea of about 18% (n=14) clinicians. About 6% (n=4) clinicians said that the radiographers' board should ensure that all quacks are removed from the fold.

DISCUSSION

Diagnostic ultrasound is a safe, effective and highly flexible imaging modality capable of providing clinically relevant information about most parts of the body in rapid and effective fashion. The practice of ultrasound has in the past been carried out by radiologist, however, the shortage of radiologist in countries abroad and indeed in Africa is attributed to an increase in the patient to radiologist ratio[6]. This prompted well trained radiographers in taking up roles in ultrasound reporting. World Health Organization noted that because of the variability in training, the quality of diagnosis faces a big question[2]. The researcher in this work sought to sample the perception of clinicians and radiographers in South East Nigeria about the competence of radiographers in ultrasound reporting. This is in line with a statement by Kawooya that if one is to train radiographers to carry out new roles like ultrasound and film interpreting; there must be a level of competence, so as to provide the referring clinician with adequate information to influence therapy decisions.

An independent sample t test carried out on both populations (clinicians and radiographers) showed no statistical difference between the self confidence of radiographers and their competence as perceived by clinicians. Results from this study showed mean scores of 2.92 ± 0.76 and 3.62 ± 0.50 for assessment of perceived competence and self reported confidence on a five point scale for clinicians and radiographers respectively with statistical significance at $p < 0.05$. Since there is no statistical difference between the perceived competence by clinicians and self reported confidence amongst radiographers in ultrasound practice, it implies that radiographers are as skillful in practice as they feel. The fact that over 60% of radiographers do not receive complaints about their reports also points to their high level of proficiency and confidence. This is in line with a work carried out by Hoffman & Vikestad, to investigate the accuracy of sonographers educated in Norway and to assess the quality of their work; results showed that 95.1% of sonographers' findings were consistent with those of radiologist[13]. Sonographers were able to differentiate negative from positive findings in the upper abdomen and demonstrate accuracies similar to experienced radiologist as a result of confidence gained in practice.

Results from this study also support a work carried out by Dongola and his colleagues to evaluate the accuracy of upper abdominal ultrasound scanning performed by sonographers in a district general hospital in UK[14]. A random group of one hundred and four (104) patients were included in the study, sixty two (62) of whom had an ultrasound abnormality, errors in scanning were identified in only 10 patients (9.6%) of whom five (4.8%) were felt to be potentially significant. They concluded that sonographers' accuracy in reporting upper abdominal scans was 90%. Radiographers are now seen to perform well in ultrasound reporting as stated in a work by Leslie and co authors where radiographers and radiologist reporting had no statistical significant difference[9].

Even though the confidence level is high, though not significantly higher, it is in line with a previous study by Yazbek et al to assess the degree of confidence with which expert ultrasound operators make diagnosis of benign borderline and invasive malignant tumors and its effect on diagnostic accuracy and intra-observer agreement[15]. Digitally stored static two-dimensional B-mode images of representative cases of benign, borderline and malignant ovarian tumors were independently assessed by three expert ultrasound operators who had not performed the original real time ultrasound examination. The experts classified the tumors as benign, borderline or invasive malignant and they also indicated the degree of confidence within which they made the diagnosis (certain, probable and uncertain). One hundred and sixty six cases were included in the final data analysis. The diagnostic accuracy of all three operators decreased with decreasing level of confidence. Intra observer agreement between any two experts was very high when they were certain of diagnosis (rates of agreement 98%, 99% and 100%), but it was significantly lower with a moderate level of confidence (78%, 71% and 76%).

The accuracy of expert ultrasound operators using pattern recognition depends on the degree of certainty with which the diagnosis is made. Intra observer variability is also influenced by operator's confidence in making the diagnosis. They suggested that the level of confidence with which diagnosis is made be included in the report. The degree of ultrasound operators' confidence in making diagnosis is likely to be determined by the level of their skill and experience.

However, a previous work by Agwu and his colleagues[16] shows that there is significant error in ultrasound reports gotten from radiographers in the same locality. The clinicians however stated that the reports were still useful. This may go to show that with improvement in post graduate training and possibly better formal and informal training of radiographers over the last twelve years (2001 -2013), there has been a significant improvement in the ultrasound reporting skills of radiographers even though occurrence of error cannot be entirely ruled out.

Results from this study also showed that undergraduate training alone does not provide radiographers with the proficiency required in making ultrasound diagnosis. This is seen as only 3.7% of the sampled population of radiographers attributed their method of gaining skills to undergraduate program, a need for more training at undergraduate level is needed in line with the specifications of World Health Organization thus: a significant benefit in health care will result from improved skills in the performance and interpretation of ultrasound examinations[2]. Majority (27.8%) of the radiographers acquired ultrasound skills through experience with only 3.7% acquiring the knowledge during undergraduate education. This is an indirect clarion call for curriculum review to include many courses in ultrasonography. This is in line with suggestions made by some clinicians, that undergraduate education should be reviewed to enhance more experiential learning.

The response from radiographers shows that 64.8% (n=35) rarely received complaints about their reports while only a minute percentage 1.8% (n=1) receive complaints always. This indicates improvement in ultrasound skills. Years of practice are a key factor in confidence and competence assessment of radiographers with 72.2% of radiographers in strong agreement. Majority of the clinicians also stated their preference to patronize experienced radiographers. These agree with the report statement of World Health Organization that the use of diagnostic ultrasound by individuals without proper training and experience adds to the likelihood of unnecessary examinations and misdiagnosis[2].

The clinicians also reaffirmed years of practice as an important factor in sending a patient to a radiographer for ultrasound scan, they also stated educational qualification as a criteria giving credit to radiography sonographers. Clinicians also noted that radiographers should always seek second opinion when in doubt and should also co- operate with radiologist and gain adequate exposure before taking off on their own.
Radiographers also pointed out that attending refresher course, good knowledge of clinical pathology; anatomy and post graduate training are factors necessary in improving their confidence. This is in line with a report by Kawooya[6] that if one is to train radiographers to carry out new roles like ultrasound and film interpreting; this must be to level of competence, thorough enough so as to provide the referring clinician with adequate information to influence therapy decisions.

The major limitation of this study is that it was carried out in South East Nigeria and hence its generalization to the entire Nigerian population should be made with caution. Further studies in this area in other geographical zones in Nigeria are also recommended. Statistical equality in the level of clinicians' perceived competence and self reported confidence among radiographers in this study showed that radiographers have a reasonable level of competence in sonography. Post graduate education and training will also improve the accuracy of radiographers' ultrasound reports while a restructuring of the undergraduate curriculum to include more courses in ultrasonography is also paramount.

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