JOURNAL OF RADIOGRAPHY AND RADIATION SCIENCES

NIGERIAN RADIOGRAPHY STUDENTS' CLINICAL EXPERIENCE: WHY VIRTUAL RADIOGRAPHY SIMULATION SHOULD BE INTRODUCED AS AN ADJUNCT TO CLINICAL TRAINING

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https://doi.org/10.48153/jrrs/2023/VIKX9226

Article info
First Submission
14th July 2023

Revised
4th August 2023

Accepted
26th September 2023

ABSTRACT

Objective: To evaluate the clinical training experience of radiography students and their tutors and assess their attitude towards the use of virtual simulation as an adjunct to clinical postings.

Methods: A survey was conducted on third- to fifth-year radiography students in five universities offering radiography as a five-year degree programme and on radiographers involved in students training. Data was collected and analysed using SPSS v 21. Results were displayed using tables and figures.

Results: A total of 276 students (169 males and 107 females) and thirty-six radiographers (24 males and 13 females) responded. The students were exposed to a wide range of modalities, but most of them (78.3%, n = 216) reported that they had issues with overcrowding and were not allowed to attend to patients (60.1%, n = 166). 55.8%, n = 154) classified themselves as "static observers" as opposed to "passive" (20.7%, n = 57) and "active" (23.6%, n = 65) observers. They rated themselves "average" in clinical practise but were equally divided on their levels of satisfaction with their clinical experience, with 52.9% (n = 146) expressing dissatisfaction against the 47.1% (n = 130) that expressed satisfaction. Few of the radiographers who have used VR software before responded that they were open to newer and better methods of clinical training.

Conclusion: Based on the findings of this study, the learning environment for clinical procedures for the students is not conducive. The introduction and use of virtual simulation will be a welcome development, as it will improve the clinical training of radiography students.

Keywords: Clinical postings, Virtual radiography, Simulation training, Radiography education

Introduction

Radiography is a fast-growing professional course in Nigeria and is gaining popularity among prospective university students. Consequently, the number of universities offering the course as well as the number of students admitted per session have more than

quarterly increased in the last decade [1]. This is a welcome development considering the perennial dearth of radiographers in Nigeria [2]. Unfortunately, the training facilities available for this growing number of students have not been improved [3]. Such disparity between the number of admitted students and available training facilities leads to various challenges faced by students during clinical training, such as the inability to connect theoretical discussions during lectures with clinical practise, very little time available for the students to observe or assist in radiographic procedures critical to their learning and inadequate exposure to specialised procedures [4]. The long-term effect of this situation is seen in the less-than-average academic performance of students during their clinical posting examinations as well as their inadequate preparation for hospital practice post-graduation.

As the number of radiography students admitted into the university each year rises steadily without a corresponding rise in the number of training facilities in sight, it is essential to introduce alternative clinical training methods to supplement the students' insufficient clinical exposure latitude. Simulation of a hospital environment, which entails the use of part-task trainers, physical model simulators, simulated patients, and computer-based virtual simulators, is a potential solution or adjunct that could come in handy [5]. A study has shown high geometric accuracy with as little as 1% difference between simulated hospital environments and real-life clinical situations [6]; hence, its use for clinical training is not in doubt. Shiner [7] studied the effect of simulation on the clinical competence of third-year radiography students and reported an improvement in the students' preparedness and understanding of clinical situations. In another study [8], a computer-based simulation software, Virtual Radiography™, was used in the training of radiography students in positioning techniques, and their responses were obtained on its use. Students noted that they were able to repeat procedures until they were satisfied with their results. They also reported an improvement in their technical, image evaluation, problem-solving, and self-evaluation capabilities. Radiography is offered in Nigeria as a five-year degree program, with the first two years dedicated to medical courses (anatomy, physiology, biochemistry, etc.), and the other three years for radiography-based courses and clinical postings. As of the time of this study, only four African universities and six Nigerian universities have installed virtual simulation software (Virtual Radiography™) as an adjunct for clinical training purposes. This study aims at assessing the challenges faced by Nigerian radiography students during clinical postings and the perceptions of the students and radiographers on the use of virtual simulation to augment clinical training.

Methods:

This is a survey involving third- to final-year radiography students in five Nigerian universities offering medical radiography as a five-year Bachelor of Science degree programme and professional radiographers working in hospitals. Ethical clearance was obtained from the research and ethics board. First- and second-year students were excluded from the study since they are yet to be exposed to clinical postings and offer pre-clinical courses (anatomy, physiology, and biochemistry). Radiographers that responded were only from clinical and academic extractions since they were involved with students training, while radiographers that were self-employed, working in ministries of health, and others not directly involved with students training were excluded from the study. They were invited to fill out an online survey typed into Google Forms™ and distributed using emails and other social media handles easily accessible to the target population. To reduce the incidence of possible double responses, the respondents had to include their student and staff identification numbers. The survey was designed for radiographers and students separately. The questions for radiographers consisted of two sections: the first collected demographic data, while the second contained questions about knowledge and use of virtual simulation for teaching clinical postings. The questions for radiography students had three sections: the first held demographic information; the second was on their experiences during clinical postings; and the third dealt with their knowledge of the use of virtual simulation for training. A brief explanation of virtual radiography was included for the benefit of those who may not have heard about it. To avoid incomplete answers from the responses, all the important questions were tagged "required," which ensured that they were answered before submission. Responses were compiled into an Excel sheet, and results were presented using graphs and tables. The data for the study is available here [9]

Results:

A total of 276 responses from students between 300 and 500 levels were obtained, while thirty-eight responses were obtained from the radiographers. The students consisted of 169 males and 107 females aged between 16 and 31 years (Table 1). Many of the students attended clinical postings twice a week. Although they were exposed to a wide range of modalities, most of them (78.3%, n = 216) reported that they had issues with overcrowding and were not allowed to attend to patients (60.1%, n = 166). A greater percentage of the students (68%, n = 188) witnessed special examination procedures, but more than half of them (55.8%, n = 154) classified themselves as "static observers opposed to" as opposed to "passive" (20.7%, n = 57) and "active" (23.6%, n = 65) observers. The students further reported poor exposure to modalities like Magnetic Resonance Imaging (81.2%, n = 224), Radiotherapy (94.9%, n = 262), Mammography (64.1%, n = 177), and Computed Tomography (67%, n = 185). Their exposure to ultrasound was balanced, as more than half reported adequate exposure and satisfactory participation (55.1%, n = 152). They rated themselves "average" but were equally divided on their levels of satisfaction with their clinical experience; 52.9% (n = 146) expressed dissatisfaction against 47.1% (n = 130) that expressed satisfaction (Table 2). Of the thirty-eight radiographers who responded, twenty-four were male and fourteen were female. 47.4% (n = 18) of the respondents were lecturers, while 52.6% (n = 20) were clinical radiographers. Their academic qualifications and assessment of students' clinical performance are shown in Table 3. Based on their experience in the clinical training of students, most of the respondents preferred the apprenticeship method (44.7%, n = 17) over hands-on (26.3%, n = 10) and the use of phantoms (7.9%, n = 3). Most of the respondents have never used virtual radiography simulation before, as they only learned about it via this survey. They were positive about its impact on students training (Table 4)

Table 1: Demographics of students (N = 276)

		N	%
Gender	Male	169	61.2
	Female	107	38.8
Age	16-20 Years	46	16.7
	21-25 Years	187	67.8
	26-30 Years	40	14.5
	Thirty-one and above	3	1.1
Year of study	3rd Year	88	31.9
	4th Year	91	33.0
	5th Year	97	35.1

Table 2: Students clinical posting experience and knowledge of virtual radiography

		N	%
Duration of clinical posting	6 months	79	28.6
	1 Year	45	16.3
	2 Years	67	24.3
	3 Years	85	30.8
Frequency of clinical postings	Every day during the Holidays	8	2.9
	Once in a month	3	1.1
	Once in three weeks	1	.4
	Once in two weeks	3	1.1
	Once a Week	63	22.8
	Thrice weekly	67	24.3

	Twice weekly	131	47.5
Is there an issue of overcrowding?	No	60	21.7
	Yes	216	78.3
Rate your competence in clinical practise	Poor	18	6.5
	Fair	90	32.6
	Average	140	50.7
	Good	28	10.1
Are your clinical postings worthwhile?	Strongly disagree	17	6.2
	Disagree	38	13.8
	Agree	151	54.7
	Strongly agree	70	25.4
Prior knowledge of virtual radiography	Lecturer	69	25.0
	Internet	43	15.6
	Questionnaire	164	59.4
Should virtual simulation learning be encouraged?	Yes	107	38.8
	No	169	61.2

Table 3: Demographics of radiographers

		N	%
Age	31-35 years	19	50.0
	36-40 years	4	10.5
	41-45 years	5	13.2
	46-50 years	6	15.8
	51 years and above	4	10.5
Gender	Male	24	63.2
	Female	14	36.8
Professional practise	Academic	18	47.4
	Clinical	20	52.6
Duration of practise	<10 years	29	76.3
	11-20 years	5	13.2
	21-30 years	4	10.5

Table 4: Radiographers opinion on clinical training of students and Virtual radiography use

		N	%
Training method used	Apprenticeship	17	44.7
	Hands-on	10	26.3
	Phantoms	3	7.9
	Traditional	8	21.1
How do you assess students' performance?	Poor	0	.0
	Fair	15	39.5
	Good	22	57.9
	Excellent	1	2.6
Have you heard about Virtual Radiography before?	No	11	28.9
	Yes	27	71.1

How did you know about Virtual radiography?	Conference	3	7.9
	Questionnaire	12	31.6
	Internet	8	21.1
	Colleague	15	39.5
Radiographers' opinion on Virtual Radiography			
Openness to new methods	No	4	10.5
	Yes	34	89.5
Free access by students	No	8	21.1
	Yes	30	78.9
No risk to patients	No	18	47.4
	Yes	20	52.6
Allows for mistakes	No	14	36.8
	Yes	24	63.2
Experiment ability	No	20	52.6
	Yes	18	47.4

Discussion:

The use of simulation in clinical training is particularly important considering different intrinsic aptitudes and rates of skill acquisition, subjectivity in the approach of clinical instructors to training, and limitations in the duty hours of trainers [5]. As a teaching method, it allows students to practise in a safe environment, improve patient safety, communication, and further enhance the student's ability to think and act like professionals [10]. It has also been shown to be fully accurate in replicating real-life situations [6]. Since it is not possible to prepare students for all scenarios in the clinic [11], it was recommended that the use of simulation could supply such experience to a considerable degree [12], which translates to the better clinical performance of the students. Due to the task deconstruction method that the software offers, Sapkaroski and colleagues [13] showed how virtual simulation could significantly improve the positioning abilities of students trained using immersive virtual simulation.

From the findings of the survey, the conditions radiography students face during clinical posting are suboptimal and do not expose them to the full requirements necessary for a complete clinical experience. Overcrowding was a major problem, considering the increase in the number of admitted students without a concomitant increase in the training facilities available. This made communication with tutors difficult, reduced the length of time students spent in each modality, as was seen in their poor exposure to CT, MRI, and mammography, and made the entire experience uninteresting, especially for the third year, who had enthusiasm for their first clinical experience. This naturally led to the majority expressing dissatisfaction with their clinical experience. An earlier study in an African country has highlighted challenges faced by radiography students in their clinical postings, including a divide between theoretical and practical knowledge, inadequate exposure to some specialised procedures, and insufficient time allotted to each treatment room [4]. Virtual Radiography simulation for clinical training is a recent technology in Africa, though it has been around for some time. Expectedly, many of the students and 31.16% of the radiographers heard about virtual simulation via this survey. This may explain the unenthusiastic response to embracing it as an adjunct method of training. Additionally, an earlier study among our population had highlighted the paucity of knowledge among students about virtual learning in general [14]. Tutors preferred the apprenticeship method of training the students to accommodate their numerical strength, as most of the students would not be able to have hands-on experience and would merely be "static observers," as the students themselves

admitted. However, they were aware of virtual radiography simulation and were open to its use because they felt it would give students free access to simulated training and allow for the repetition of mistakes. Up to 80% of the respondents reported that there was a general problem with overcrowding in the clinical area. This reduced the ability of the students to take part and learn, creating a hostile environment for the patient undergoing the radiographic procedure. The use of virtual simulation would lessen the number of students who report for clinical placements because a sizable number would be absorbed by the sessions of virtual simulation, halting the current problem of overcrowding. The use of virtual simulation will naturally decongest the clinic, increase students' participation, and interest, and offer a conducive environment for the patient being examined. In climes where virtual radiography has been applied, it has been aimed at improving the quality of clinical training without exposing patients to an undue risk of irradiation or repeated exposure due to handling by inexperienced hands. Studies have shown that where it has been applied, students have responded favourably. Shanahan [8] reported that students were positive about the ease of use of simulation as well as their ability to handle and control the equipment as required. They also reported that simulation "positively developed their technical, image evaluation, problem-solving, and self-evaluation abilities." It is the adjunct for improved radiography education, considering the several bottlenecks the clinical training of radiographers currently faces.

Conclusion

The clinical environment where radiography students in our clime train to become professionals requires improvement, and the use of virtual simulation would be a welcome development. It would improve problems of overcrowding and student participation in clinical procedures. Additionally, it would offer the tutors more time to focus on the students for better clinical learning outcomes.

Recommendation

The virtual Radiography simulation software should be obtained by radiography departments in Nigeria to serve as an adjunct to the clinical posting experience of the students.

Acknowledgements

None.

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