

Transferability of Clinical Skills Acquired On Simulator to Real Life Clinical Practice

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Abstract

Aim: The aims of this study were to determine the relationship between performances of students in clinical skills laboratory and real life clinical practice and to determine the experiences and views of instructors as it relates to teaching in skills laboratory.

Methods: The performances of two randomly selected sets of graduates in the operative examinations conducted in skills laboratory were compared with the performances of the same sets of graduates in the operative examinations conducted on life patients two years later using Spearman's rank test. Experiences and views of two teachers from each of the six dental schools in southern Nigeria as it relates to teaching in clinical skills laboratory were obtained using a structured questionnaire.

Results: There was an insignificant correlation between the outcomes at both examinations (p value was 0.18). Most of the respondents (62.5%) agreed that teaching in skills laboratory was tiresome and most (75.0%) strongly agreed that the number of students constitutes a serious challenge to learning. Most of the respondents regarded their role in skills laboratory as that of an expert as against that of a facilitator.

Conclusion: There was a weak correlation between performances in skills laboratory and real life environment. Students' number appears to make teaching in skills laboratory unpleasant and teachers had a wrong perception of their role.

Key Words: Simulator, Clinical skills lab, Transferability, Dental Education

Introduction

Simulators enable students to learn and practice dentistry without any negative consequences for human patients [1]. In addition, simulation environment provides participants the freedom to make mistakes, correct them and improve communication and processes of care [2]. With the rising standards and increasing complexity of modern dental/medical care there is a need to further introduce clinical students to a variety of difficult or unusual cases to enhance their problem-solving skills in the clinical settings [1]. Also, because of time constraint in clinical practice, the reasons that informed treatment decisions and the alternatives available may not be discussed with clinical students, particularly during business round. Laboratory-based training programme is becoming increasingly integrated into both undergraduate and post graduate medical and allied sciences education programmes [3-5]. This is because, doctors with less than acceptable level of skills are at risk of stress when on duty and they constitute potential source of medical errors [6].

Simulation is a good alternative to the use of patients for clinical skills demonstration and practice. It ranges from the very simple to the extremely complex types [5]. While the use of simulation has been proposed as the next major step in the evolution of health science education, dentistry has been using various types of simulations for many years as a standard part of the curriculum so as to ensure that students are both competent, confident and safe at a range of clinical procedures before they enter the clinic. New dental graduates are expected to have acquired full complement of skills and competence necessary for general clinical dental practice at the time of graduation and are therefore sometimes exempted from the

mandatory internship programme which is a prerequisite for independent clinical practice in medical profession [5].

Current and projected approaches to dental education have created a wide interest in clinical simulation [7]. However, Ahmed [8] reported that there is very little data to support the assumption that these facilities actually improve the performance of technical skills by students. Recent studies indicate that clinical students may face problems applying skills learnt in skills laboratory setting when they enter their clerkships. Studies addressing this 'transition problem' were said to be concentrated in industrialized countries [9]. In addition, it has been reported that clinical experts who take up teaching appointments rarely receive a formal training in this regard [10]. The experiences and views of dental educators in southern Nigeria on teaching in clinical skills laboratory and the proportion that have received one form of training or the other in biomedical education has not been reported. The current study was designed to determine the relationship between performances of students in skills laboratory and real life clinical practice and to determine the experiences and views of dental clinicians as it relates to teaching in skills laboratory.

Methods

Study design

The study had two parts. The first part was designed to determine the relationship between performances of students in the clinical skills laboratory and real life clinical practice while the second part was designed to determine the experiences and views of dental clinicians as it relates to teaching in

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skills laboratory. The first part involved a retrospective review of examination reports and academic records of the Department of Restorative Dentistry, University of Ibadan. The performances of selected sets of graduates in the professional operative examinations conducted at the clinical skills laboratory (phantom heads) during the fourth year was compared with the performances of the same sets of graduates in the professional operative final examinations conducted with life patients as subjects in the sixth year. The Dental School of University of Ibadan has been graduating students since 1980, but for a set of graduates to qualify for selection into this study, under listed criteria must be met.

Inclusion Criteria

- The skill for tooth cavity preparation taught and examined in clinical skills laboratory must also be the skill tested on life patients two years after (sometimes, another set of skills were examined in the final examination).
- The examiners involved in the pre-clinical examination conducted at the clinical skills laboratory must be the same examiners involved in the clinical examination conducted on life patients (these examiners were not always the same) and
- The examination records of the students must be fully available in the Department.

Based on these criteria, six sets of students qualified for inclusion into the study out of which two convenient samples (Sets A and B) were selected by balloting. There were 32 students in Set A who participated in the pre-clinical and clinical examination while set B had 23 students who participated in both examinations. The procedures, equipment, instruments, materials and examiners involved in the two examinations were the same; the only difference being the use of phantom heads as patients in the former examination as oppose to life human patients in the latter. The assessment protocol employed for these examinations required the examiners (at least two) to independently assess and score each candidate's performance in cavity preparation, lining and amalgam restoration; after which an average score is determined.

In the second part of the study, a structured anonymous questionnaire was employed to obtain information from dental specialists involved in operative dental education in the dental schools located in the southern part of Nigeria. Six of the seven fully established dental schools in Nigeria were located in the south. There were additional two new schools, one in the south and one in the north. The new schools were excluded from the study because they have not had a learning experience in clinical skills laboratory. The questionnaire seeks information relating to personal experience, student load, availability of teachers, grading of students' performance and role of clinical teacher in clinical skills laboratory. The questionnaire also requested for information regarding whether the experts have had a formal training in biomedical education or not. A five-point response options (Likert scale) was provided as follows: Strongly Agree=5; Agree=4; Undecided=3; Disagree=2; Strongly Disagree=1. The instrument was pretested for clarity among the restorative teachers in University of Port Harcourt.

Not all the teachers in Restorative Dental Departments

were involved in operative dental training. Other areas of specialization in Restorative Dentistry apart from Operative Dentistry include: Removable Denture Prosthodontics; Fixed Partial Denture Prosthodontics, Maxillofacial prosthodontics and Endodontic. In most of the schools, not more than two lecturers were involved in operative dental education. Therefore, two lecturers who were actively involved in the teaching of Operative Dentistry and acquisition of operative clinical skills in each of the six schools were targeted giving a total of 12 lecturers in all. Only one lecturer was on ground at the time of the study in two of the schools and so 10 participants were eventually served the questionnaire. The questionnaires were self-administered in University of Nigeria, Enugu campus and University of Port Harcourt; but in the other schools, the instruments were administered through contact persons not participating in the study. The questionnaire had a brief introductory note that explained what the study was all about. The research protocol for the study was approved by College Research Ethics Committee of University of Port Harcourt prior to the commencement of the study.

Statistical analysis

The data was entered analyzed using SPSS for Windows version 16.0, (SPSS Inc. Chicago Illinois, USA). Descriptive statistics was performed on all the questionnaire items. Spearman's rank test was used to assess the existence of correlation between performances in class II restorative procedure exams conducted on phantom heads and class II restorative procedure exams conducted on real life patients about two years after. Significance level was set at $\alpha=0.05$.

Results

Eight out of the ten questionnaires that were sent out were properly filled and returned giving a response rate of 80.0%. Five of these respondents were males and the remaining 3 were females. There was one respondent each from Universities of Benin, Enugu, Lagos and Port Harcourt and there were two respondents each from Universities of Ibadan and Ife.

Views of teachers and their experiences on teaching and learning in clinical skills laboratory are shown in *Table 1*. The result of the enquiry about personal experience in handling clinical session in skills laboratory shows that most of the respondents agreed (62.5%) with the insinuation that teaching in clinical skills laboratory is tiresome and majority of the respondents (75.0%) strongly agreed that the number of students most times poses a serious challenge to effective teaching and learning. Half of the respondents (50.0%) strongly disagreed with the insinuation that there is enough number of personnel to handle clinical sessions. In addition, half of the respondents strongly agreed that the role of clinical instructor in skills laboratory is that of an expert. On the other hand, only one respondent strongly agreed that the role of clinical instructor is that of a facilitator. Most of the respondents (62.5%) agreed that assessment score of students vary among observers. Finally, all the respondents but one strongly disagreed with the insinuation that they have had a formal training in biomedical education.

Spearman's rank statistical test shows a positive but weak relationship between the performances in simulator learning

Table 1. Views of teachers and their experiences on teaching at clinical skills laboratory.

S/N	Characteristics	Response				
		Strongly Agree (%)	Agree (%)	Undecided (%)	Disagree (%)	Strongly Disagree (%)
1	From your experience, handling clinical session on simulator is most times tiresome	3 (37.5)	5 (62.5)	-	-	-
2	Number of students for training most times poses a serious challenge to effective teaching and learning	6 (75.0)	2 (25.0)	-	-	-
3	Most times there are enough personnel to handle clinical session in skills lab	-	1 (12.5)	-	3 (37.5)	4 (50.0)
4	The role of the instructor in the skills lab should be that of an expert	4 (50.)	3 (37.5)	-	1 (12.5)	-
5	The role of the instructor should be that of a facilitator	1 (12.5)	4 (50.0)	1 (12.5)	1 (12.5)	1 (12.5)
6	Scoring of students performance often vary among observers	3 (37.5)	5 (62.5)	-	-	-
7	You had a formal training in biomedical education	-	-	-	1 (12.5)	7 (87.5)

environment and real life clinical environment for both sets of graduates. Spearman correlation coefficient for group A was 0.14 and the relationship was not statistically significant (p value was 0.45). Spearman correlation coefficient for group B was 0.30 and the relationship was also not statistically significant (p value was 0.18).

Discussion

Our results on the experiences and views of operative dental instructors on teaching in clinical skills laboratory showed that all the surveyed dental schools had at least one respondent. The result therefore was an overview of teaching experiences in southern Nigeria dental schools and indeed Nigeria. Our result showed that most of the teachers agreed with the insinuation that handling clinical session on simulator is most times tiresome. This result is at variance with a previous report that suggests that teaching students and residents procedural skills can be enjoyable [11]; it simply requires some planning, even for straightforward tasks. In addition, most of the instructors also agreed that the number of students for training poses a serious challenge to effective learning. Increased students intake had been reported in the recent times in both developing and industrialized countries [8,12-14]. Most of the students at the International Medical College in Malaysia in their evaluation report of leaning in skills laboratory complained that there were usually too many students in the clinical skill unit at a time [1]. Peeraer et al. [6] reported that in a country where the ratio of students to faculty is relatively high, making sure that all the students understand each lesson and have completed the required training can be problematic. For optimal learning outcome at the clinical skills laboratory, the number of students should be manageable [15].

Half of the instructors who participated in the study strongly disagreed with the insinuation that most times there are enough personnel to handle clinical session on simulators. Availability of sufficient number of qualified full-time dental faculty is sometimes a problem in dental schools and the few that are available may be loaded with administrative duties [8]. This may cause a significant strain in their teaching and

clinical skills demonstration responsibilities. It is a well-known fact that most qualified medical and dental personnel prefer full time clinical practice to faculty jobs for economic reasons. To tackle this challenge of staff shortage at the clinical skills laboratory, part-time instructors and resident doctors are often employed to bridge this avoidable gap [4,8,12,16]. The inappropriate students-staff ratio indicated by the respondents in our study may explain why the instructors indicated that teaching in clinical skills laboratory is most times tiresome. As regard whether the role of clinical instructor should be that of an expert or facilitator, 50% of the respondents strongly agreed that the role of the instructor is that of an expert as against only 12.5% who opted for facilitator. Ellington and Race [17] stated that the role of teachers/instructor/trainer in simulator learning environment is that of an organizer and facilitator. Effective instructors don't teach so much as they facilitate learning. According to Chapnick and Chapnick [18] the students that regard effective teachers as those that are "useful, helpful, and valuable," are more than those that regard effective teachers as "knowledgeable" or "experts".

When the views of the respondents as regard the variability of students' assessment scores among observers were sought, the result showed that most of the respondents agreed with this assertion. Variation among assessors in the rating of students' performance is not a new development. Omer et al. [4] stated that much of the literature on assessment in dental schools focused on strategies to improve calibration among raters in preclinical laboratory and clinical courses and emphasis had been placed on calibration techniques to increase consistency among evaluators. Doubt over reliability of observations made by skills' assessors is a recognized challenge in simulator learning environment [8]. The need to make adjustments for "hawk" (hard) and "dove" (easy) raters had also been recognized. In addition, the number of observers required for clinical competence examinations had also come under focus in the recent past [4]. These observations informed why the average score of the assessors are usually taken.

Our result on whether the teachers have had a formal teacher training or not; showed that all the respondents but one has not had any formal training in biomedical education.

Chapnick and Chapnick [18] reported that most dental schools do not offer their clinical instructors formalized teacher training. Similarly, Spencer [10] stated that few dental faculties received formal training in teaching skills before accepting a teaching role. New dental faculty members of staff are supposed to learn skills relating to teaching methods, assessment and curriculum developments among others to enable them perform optimally and professionally. A good clinician is not necessarily a good teacher and examiner. To address this problem of lack of teacher training among dental and medical teachers in our environment, the University of Ibadan has organized an on-line Master degree programme in biomedical education for health professionals in the West African sub-region.

Predicting future professional achievement has been an elusive goal in dental education [19]. The statistical test conducted to check whether the performance of students in simulator learning environment has a significant relationship with that in real life clinical practice shows a weak relationship. This finding corroborated previous reports that found no significant correlation between preclinical grades and clinical grades [19]. Rethans et al. [20] stated that what doctors do in controlled assessment situations correlates poorly with their actual performance in professional practice. Curtis et al. [19] similarly reported no correlation between a typodont preparation examination and a clinical competency examination involving the preparation of a full crown. The insignificant relationship between the outcomes at the two examinations does not, however, suggest that simulation technology is useless.

Widyandana et al. [21] reported that the educational benefit of training at clinical skills laboratory is considered unproven and that there is no hard evidence to lend credence to its usefulness. This view was corroborated by Smith [22] in his discussion on transferability of clinical skills where he stated that it is practically impossible for training conducted within a skills laboratory to fully mimic the clinical setting and that students may encounter problems when they attempt to transfer the clinical skills they learned in the laboratory to the clinical setting. As a matter of fact, simulation technology surely facilitates learning [23]. Seymour et al. [24] observed that laparoscopic cholecystectomy (gall bladder surgery) training in clinical skills laboratory reflected in operating room performance of the trainees. Peeraer et al. [6] reported further, that Dutch students who received “integrated skills training” as part of their undergraduate medical course demonstrated more clinical skills than their Flemish counterparts who did not enjoy similar privilege. Similarly, Wayne et al. [25] reported that a simulation-based educational program significantly improved the quality of care provided in real live clinical practice.

In Class II cavity preparation in the clinical environment, students are exposed to different variables like varied

extent of tooth decay, varied degree of salivation, mouth opening, pain threshold and so on which may affect overall performance of these candidates. These confounders are often not accounted for in the process of evaluating performance. Furthermore, the reason why students experience initial difficulty in transferring the skills acquired at clinical skills laboratory to real life clinical practice had been linked to the fact that students needed time to adapt to the clinical setting and besides the time lag between the period the skills were acquired on simulators and the time of entry into clinical practice has been said to be contributory [9]. It thus appears that students needed assistance as regard transferring the skills acquired on simulator to real life clinical practice. Ensuring appropriate clinical supervision has been described as a major problem in all healthcare professions [26]. Haskell [27] stated that significant learning and transfer will not take place unless schools teach and develop cultures of transfer. Damassa and Sitko [28] similarly reported that regular supervision of clinical skills practice in a simulated environment promotes the successful transfer of these skills to real world environment. However, the result of this study is limited by the small sample size employed.

Conclusion

The performances of students in simulator learning environment do not have a significant relationship with their performances in real life clinical practice. Inappropriate students-staff ratio appeared to make teaching experience at clinical skills laboratory unpleasant. Also, clinical instructors had a wrong perception of their role in clinical skills laboratory and majority had no form of biomedical education that prepare them for teaching appointment.

Recommendation

Conscious and concerted efforts should be made to assist students to have enough hands-on experience and to transfer the skills they acquire on simulators to real life clinical practice. Clinical instructors should always remember that undergraduate skills training at clinical skills laboratory is not designed to replace clinical experience as the key mode of learning.

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