

ORIGINAL ARTICLE

Dichotomy between theory and practice in chest radiography and its impact on students

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Abstract

Introduction: It is important that theory is synchronous with clinical practices that students engage in. Lack of congruence between theory and practice presents serious problems to students. This study was therefore conducted to determine if there was a theory–practice gap in chest radiography during clinical rotations, and any associated causes and effects on radiography students. **Method:** A descriptive survey design was used to conduct this study from 2 February to 27 July 2014. A semi-structured questionnaire consisting of open- and close-ended questions was used to purposively collect data from 26 radiography students in Ghana who had completed theory lessons in chest radiography and had either completed or were undertaking clinical rotations in chest radiography. **Results:** Twenty-five (96%) respondents indicated the presence of theory–practice gap in chest radiography during clinical rotations, where differences between theory and clinical practice were observed. Lack of working materials 16 (62%), heavy workload 14 (54%), equipment breakdowns 14 (54%) and supervisory factors 11 (43%) were identified as the causes. Many students (81%) experienced diverse adverse effects such as confusion 10 (38%), poor performance during clinical examinations 6 (23%) and entire loss of interest in the professional training 1 (4%) of this dichotomy. **Conclusion:** Dichotomy between theory and practice found in chest radiography has diverse adverse effects on students. Regular feedback on the quality of clinical practice received by students should be encouraged to determine the existence of any gaps between theory and practice in order to promote effective clinical rotation programmes in radiography.

Introduction

In the health science professions, clinical or practical experience is necessary to develop knowledge and skills acquired theoretically. For this reason, both theoretical and clinical components of education are included in health science educational programmes. In radiography, a curricula consisting of 50% theory and 50% practice is recommended.¹ The purpose of the theoretical component is to provide students the opportunity to learn principles and concepts relevant for professional performance.² The clinical practice on the other hand is expected to allow students to understand the theoretical reasoning that underlies the purpose of clinical task while

allowing students the experience of performing that task.³ McCabe in Atanga et al.⁴ described clinical practice experience as the ‘heart’ of professional education as it provides students with the opportunity for consolidating knowledge, socialising into the professional role and acquiring professional values.

Educational history suggests that, both theory and practice in the past have been delivered to students by educators mostly at lecture halls and the institution’s clinical laboratories or facilities. However, lack of experience in clinical settings was often observed in health education programmes.⁵ This necessitated the incorporation of clinical rotation in health care programmes to provide students opportunities of direct

contact with patients and their relatives, hospital staff and hospital equipment.^{4,5} The clinical rotation component of education is meant to provide students the opportunity to integrate skills and knowledge from the classroom setting into the clinical practice setting.⁶ It is also to offer students the ability to learn about the complex health issues of patients, practice selected technical skills and develop communication skills in the clinical setting.⁷ In addition, clinical rotations help students engage in the clinical environment, acquire new knowledge and skills and participate alongside many health professionals and thereby learn how to work in a team.

Effective clinical rotations are essential for improving competence and research-based education in radiography.⁷ However, diverse challenges including theory–practice gap encountered by students during clinical rotations have been reported.^{4,6,8} Theory–practice gap is the discrepancy between what is taught (theory) in the classroom and what is actually practised clinically.⁹ It is considered detrimental to radiography education and effective practice, and has profound implications for the future of the profession.¹⁰ Duchscher and Cowin¹¹ observed in the nursing profession that theory–practice gap leaves students and new nurses marginalised, and fosters feelings of isolation, vulnerability and uncertainty. According to Lambert,¹² the absence of theory-based practice modelled for students may actually result in ‘de-professionalisation’. Rolfe¹³ also indicated that qualified professionals have had some experience of this so-called theory–practice gap, but argued that it is probably felt most acutely by students. In particular, these students often found themselves torn between the demands of their tutors to implement or practice theory on one side, and pressure from practicing professionals to conform to the constraints of real life clinical situations on the other side. Mantzorou¹⁴ also found that this gap often left students in a state of confusion.

Identified causes of theory–practice gap during clinical rotations include the supervisors’ and preceptors’ level of experience and competence.⁹ Besides discrepancy between theory and organisational protocol, heavy workload and poor supervisee–supervisor relationship have all been cited as causes of theory–practice gap.⁹ Other studies have also found theory–practice gap to be associated with lecturers’ changing role from ‘hands on’ supervision of students to focus on more research.^{15,16} The consequence is that some practising professionals assume supervisory roles with insufficient preparation, and are often unaware of the associated educational goals required of the clinical supervisory roles.^{15,16} Lack of communication and agreement between the educational institution and the clinical supervisors involved in students’ learning is said to have a serious problem in theory–practice gaps elsewhere.⁵ Therefore, investigating areas of theory–

practice gap and providing measures to curb it cannot be overemphasised.

In Ghana, clinical (third and fourth year) students of the 4-year undergraduate radiography programme are assigned to clinical rotations at imaging facilities 2–3 days a week to observe and practice under the supervision of clinical tutors. However, the inadequate number of clinical tutors renders this arrangement impracticable. Clinical supervision is therefore mostly done by the radiographers in the assigned facilities. The complaints of some clinical students about the dichotomy or existence of theory–practice gap have however not been substantiated. This study therefore investigated the issue of theory–practice gap in the most frequently performed procedure (chest radiography) in some radiology facilities in Ghana.¹⁷

Method

A quantitative study design using a descriptive survey was used for this study. At the time of the study, 30 radiography students who had completed courses in chest radiography and had undertaken clinical rotations constituted the study’s sample size except four who either took part in the pilot study or helped in the data collection.

A semi-structured, self-designed questionnaire consisting of open- and close-ended questions was used for data collection. The four-sectioned questionnaire, whose functionality was evaluated by two clinical tutors from the Radiography Department of the University of Ghana, was developed to suit the aim of the study. A pilot study and pre-testing analyses were also conducted to test the reliability and validity of the measuring instruments. Section A was designed to collect demographic data, while section B sought for information on patient preparation for chest x-ray examinations. Section C was designed to collect data on technique and radiation protection practices in chest x-ray examinations, while section D focused on supervision of clinical practice.

The participants were recruited from the Radiography Department between the periods of 2 February and 27 July 2014. The responses to the open-ended questions were categorised into major themes determined by the responses. The identified themes were counted and organised quantitatively together with the closed-ended responses. Statistical Package for Social Scientists (SPSS) version 20 was used for data processing. Descriptive statistics were then used to describe the findings.

Ethical clearance and permission to use facilities were obtained from the Ethical and Protocol Review Committee of the School of Biomedical and Allied Health Sciences and the Department of Radiography respectively. Research participants were informed that the study did not present any risk. They also reserved the right to

withdraw from the study at any point in time and were also asked to voluntarily sign a written informed consent form following detailed explanation of the study. Privacy, anonymity and confidentiality of the information provided by the participants were safeguarded. These were achieved by identifying respondents with codes and using the data only for this study. Data were also locked with secured password and discarded afterwards.

Results

All 26 distributed questionnaires were completed and submitted, constituting 100% return rate. The demographic variables of the respondents are presented in Table 1. The population consisted of more males 16 (62%) than females 10 (38%). Twenty-four years was the average age in this population. As presented in Table 1, most of them had performed clinical rotations in 3–6 imaging facilities. Twenty-one (81%) of them indicated chest radiography was *always* done in the imaging facilities, while the remaining 5 (19%) stated that this procedure was *often* done. Students were also invited during their clinical rotations to show how the procedure was done taken into consideration radiation protection measures as well as patient management techniques such as patient preparation and radiographic technique.

The high-frequency responses in Table 2 recorded with respect to ‘always’ and ‘often’ suggest compliance with technique and some radiation protection practices in chest x-ray examination. However, reports on the use of anatomical markers, regular and correct dressing of

patients in lead skirts, thorough explanation of the procedure to patients before start and checking of last menstrual periods (LMPs) of female patients in their reproductive ages were ‘not often’ or ‘never’ done and were observably high (42–69%).

Table 3 shows that lack of working materials, heavy workload and equipment break downs in addition to supervising factors constituted the major causes of dichotomy between theory and practice.

Attitude of clinical supervising radiographers towards students

The study results showed that the clinical supervisors were either *always* (8%) or *often* (58%) friendly and approachable, while the remaining 34% were considered as *not always so*. Twenty-three (88%) of the respondents confirmed that supervisors allowed them to ask questions on bothering issues during clinical rotations, while 2 (8%) of the respondents stated no. However, 1 (4%) of the respondents did not comment on the question, while another stated that the answers provided to their questions by their supervisors were always convincing. Fourteen (54%) of them stated that the answers were often convincing, while 9 (34%) indicated that the answers were not often convincing. Two (8%) refused to comment on this subject. Additionally, 2 (8%) respondents affirmed that students were *always* allowed to perform the procedure under supervision, while 16 (61%) and 8 (31%) confirmed that students were either *often* or *not often* allowed respectively. This means majority of the respondents were allowed to build clinical confidence as they performed the procedures on their own. The responses of 25 (96%) of them confirmed differences between the theory and practice, while only 1 (4%) of the respondents indicated the contrary. The effects of the differences on students are presented in Figure 1.

Discussion

The traditional model of clinical supervision (direct supervision) which involved the simultaneous presence of teachers/lecturers and group of students in a clinical area for a specific amount of time has changed due to lack of time on the part of the teachers/lecturers and the increased demand of research.¹⁸ Subsequently, the preceptor model, otherwise referred to as the mentorship model in Britain, was introduced.¹⁹ This model is meant to promote the socialisation of students by involving them in one-to-one relationships with clinical staff,²⁰ with faculty members responsible for supervising the general student/preceptor experience and ensuring that the course objectives are met.²¹ This model is suggested to be more effective than

Table 1. Demographics.

Age distribution	
Age (years)	<i>n</i> (%)
18–27	21 (81%)
28–37	5 (19%)
Total	26 (100%)
Gender distribution	
Males	16 (62%)
Females	10 (38%)
Total	26 (100%)
Educational level	
Fourth year	15 (58%)
Third year	11 (42%)
Total	26 (100%)
Number of chest imaging facilities available where students undertook clinical practice	
1	2 (8%)
2	1 (3%)
3	5 (19%)
4	8 (31%)
5	8 (31%)
6	2 (8%)
Total	26 (100%)

Table 2. Students' comments on patient preparation, radiography technique and radiation protection measures used during chest radiography in clinical placement facilities.

Activity	Response, <i>n</i> (%)			
	Always	Often	Not often	Never
Is the procedure explained thoroughly to patients before start?	–	6 (23%)	15 (58%)	5 (19%)
Are the LMPs of female patients inquired of?	–	2 (8%)	12 (46%)	12 (46%)
Are the right patient positioning and tube orientations used when needed?	2 (8%)	24 (92%)	–	–
Are the right examination instructions given?	–	20 (77%)	6 (23%)	–
Are the right FFDs used?	1 (44%)	25 (96%)	–	–
Are high kVp techniques and appropriate use of grid for general chest radiograph used?	8 (31%)	18 (69%)	–	–
Are high kVp techniques and appropriate use of grid for bedside chest radiograph used?	8 (31%)	18 (69%)	–	–
Are the right exposure factor combinations used?	4 (15%)	22 (85%)	–	–
Are anatomical markers used?	4 (15%)	6 (23%)	15 (58%)	1 (4%)
Are patients often and correctly dressed in x-ray lead skirts as taught?	–	2 (8%)	18 (69%)	6 (23%)
Are adequate collimation used during chest radiography?	11 (42%)	10 (39%)	4 (15%)	1 (4%)
Are the people that stay with and assist patients during the exposure also protected?	5 (19%)	16 (62%)	5 (19%)	–

LMP, last menstrual period; FFD, film focus distance; kVp, kilovoltage.

Table 3. Causes of theory–practice gap.

Reason provided by respondents	<i>n</i> (%)
Some supervising radiographers do not know the learning needs of the students	3 (12%)
Some supervising radiographers indicated that this is how we have been doing it.	6 (23%)
Heavy workload	14 (54%)
Equipment break downs	14 (54%)
Lack of working materials, e.g., anatomical maker and lead skirts	16 (62%)
Lack of awareness of educational objectives	2 (8%)

Some respondents gave more than one responses.

the traditional model in increasing a student's knowledge base.¹⁹ In this study setting, the later model where radiographers in the clinical facilities supervise students with the support of the clinical tutors is practiced.

Chest radiography is taught at the first and second years of the 4-year radiography programme in Ghana, while clinical practice rotation is done in the third and fourth years. Therefore, in order to determine the existence of a gap between theory and practice, the group of students consisting of 15 fourth-year students (58%) and 11 third-year students (42%) were queried on what has been taught and what is practiced in all the clinical facilities during their clinical rotations. Normally, monthly placement is done for each clinical facility every semester, and as observed (Table 1) all the respondents had been to at least a chest radiography facility.

The results of our study revealed a dichotomy between theory and practice in chest radiography, a procedure performed in most clinical placement facilities in Ghana.¹⁷ In particular, the study showed some differences between theory presented in lecture halls and what

students either observed practiced or practiced under clinical supervision at clinical placement facilities.

Theoretically and ethically, it is a professional requirement that imaging procedures are explained to patients as part of patients' preparation for chest radiography, and enquiries made about the pregnancy status of female patients in their reproductive age to avoid unnecessary exposure to any foetus. On the contrary, our study revealed a 'non-often' compliance as reported by 58% of the students who testified of absence of pre-examination explanations of imaging procedures. The fact that only 8% of the participants testified that the LMP of female patients was often inquired is consistent with the observations by Bushong²² and Compeau and Fleitz,²³ of possible and unnecessary radiological exposure of many foetuses. Aside the risks associated with this practice to patients, the frequent and repeated observation of clinical lapses by the students may have the tendency of instilling in them wrong approaches to clinical practice.

The study further established that the majority of the clinical students observed and also often practised chest radiography without the use of anatomical markers and lead skirts. This is contrary to the reports of Whitley *et al.*²⁴ and Compeau and Fleitz,²³ and thus constitutes a non-compliance of the fundamental tenets of chest imaging.

The employment of right examination instructions, film focus distance, collimation, exposure factors, patient positioning and tube orientation when needed, high kVp technique and appropriate use of grid for general and bedside chest radiography as *often* observed by the students during clinical rotations (Table 2) are good clinical practices and agreeable with the literature.^{22–24} However, the fact that the aforementioned good practices were *not always* executed by the students and the clinical

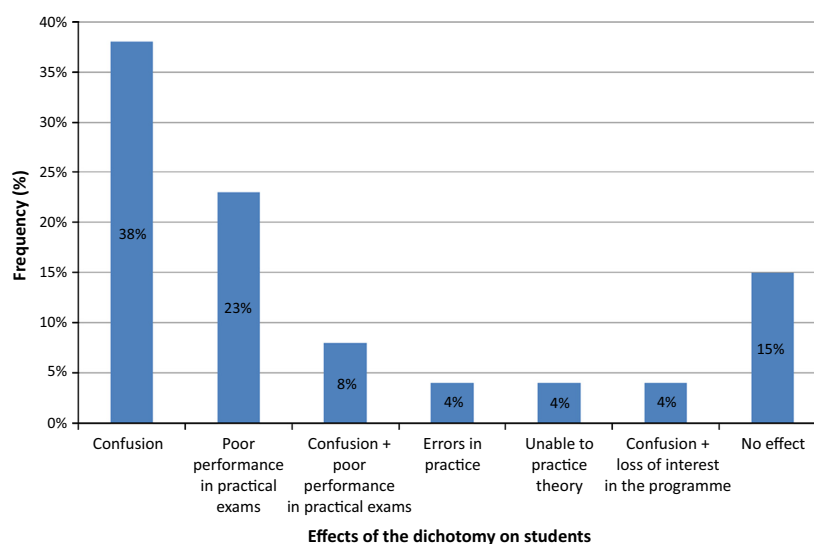


Figure 1. The impact of the theory–practice differences on students.

radiographers (supervisors) during clinical rotations presents worrying concerns as the lack of congruence between theory and practice presents serious problems to students and evidence-based health care.⁵

Duchscher and Cowin¹¹ observed in the nursing profession that such theory–practice gaps left students marginalised and fostered feelings of isolation, vulnerability and uncertainty. In this study (Fig. 1), poor performance in clinical practice and examinations, inability to practice the theory, confusion and loss of interest in the course were identified as major negative impacts of the theory–practice gap experienced by radiography students during clinical practice. These observations are consistent with the literature where other studies have indicated confusion and ‘de-professionalisation’ as some outcomes of the theory–practice gap.^{14,15,25}

The main challenges drawn in this study as the causes of theory–practice gaps were lack of working materials in the clinical facilities such as anatomical makers, lead skirts and constant equipment breakdowns (Table 3). These factors caused the radiographers to use other compromised means of practice contrary to what had been taught to the students. Heavy workload was also an added challenge which prevented the appropriate steps to be followed during chest radiography, and consequently induced a theory–practice gap. This is agreeable with the reports of Lambert and Glacken¹⁶ and Hall-Lord *et al.*²⁶ that unavailability of some working materials and heavy workload in the nursing environment were causes of theory–practice gap. Notwithstanding, other factors which were not related to equipment and working materials contributed to dichotomy between theory and practice. It was observed that the practice of some (23%) practitioners

was based on the norm ‘this is how we have been doing it’ at their work places and expected the students to do same against standard practice, which is a concern. In addition, few students reported that some supervising radiographers neither knew the learning needs of the students nor saw the responsibility to let students practice theory (Table 3). This may indicate an educational structural fault. Lewin²⁷ has suggested that learning in the clinical setting is intrinsically complex because patient needs take precedence over student’s learning needs and sometimes this can compromise students’ learning. Therefore, the academic institution has to ensure that those who train their students during clinical rotations know about their students learning needs.

Meanwhile, the evidence suggests that most of supervising radiographers were friendly and approachable, allowed students to ask questions and their responses were often convincing to students. In addition, they often allowed students to practice on their own under supervision. This is essential for students as Atanga *et al.*⁴ found that students felt confident and developed competence when given opportunities to practice on their own under friendly and welcoming supervision environments. These positive attributes demonstrated by the supervising radiographers need to be upheld by clinical preceptors in general to enhance students’ learning during clinical placements or rotations.

Conclusion

The study found dichotomy between theory and practice in chest radiography in clinical facilities where students undertook their clinical rotations in Ghana. This

dichotomy creates problems such as confusion, poor performance in practical examinations, errors in practice, inability to practice the theory and loss of interest to radiography students. The study recommends provisions of working materials to the clinical departments and periodic training for supervising radiographers on students' learning needs, their responsibilities towards ensuring effective clinical placements and update of their knowledge. Also, it is important to adopt a combination of the clinical supervision models to enable attachment of lecturers to clinical facilities and clinical radiographers for purposes of providing clinical demonstrations with theory, while augmenting the clinical tutor workforce in Ghana. Moreover, effective communication between educational and imaging departments should be ensured. A limitation of this study is that it focused on only chest radiography, therefore further research on theory–practice gap in other areas of radiography should be explored.

Conflict of Interest

The authors declare no conflict of interest.

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