

# The Effectiveness of Low-Fidelity Simulation in the Training of Undergraduate Nursing Students: Survey of Fourth Year Students in Buea Municipality, Fako Division

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## ABSTRACT

**Background:** This study entitled “the effectiveness of low-fidelity simulation training technology in nursing education in Buea municipality” was aimed at examining the effectiveness of low-fidelity simulation in the training of nursing students. Low-fidelity simulators have been utilized quite effectively by students to practice psychomotor skills in a controlled environment.

**Methodology:** A cross-sectional descriptive design was used employing a concurrent nested mixed-method approach. All students enrolled for undergraduate degree nursing program were involved in the study. Data was collected from 85 nursing students using a semi-structured questionnaire from three nursing institutions. Open ended questions were analyzed thematically with the help of exploratory tables whereby umbrella terms (codes or themes) were derived and integrated in the predefined list of indicators. Close-ended questions’ data were entered using EpiData Version 3.1 and analysed with the support of SPSS version 21.0. All statistics were presented at the 95% Confidence Level (CL), level of significance or Alpha set at 0.05.

**Results:** Findings revealed that nursing students know what a mannequin is (94.1%) and identified low-fidelity simulation as a support to clinical practice (83.5%). Set objectives were met following simulation activities (78.8%) despite its low reality with transfer of knowledge from theory to practice (87.1%) indicating increase in frequency of use in training from once a month in first year (57.6%) to more than three times a month in the fourth year (51.8%). Also, it was identified from the coded themes that learners enjoy participating in simulations and find them rewarding and educationally satisfying with students indicating that it results in learning, acquisition of knowledge and practical skills amongst others and that more time should be allocated for the simulation activity.

**Conclusion:** It is based on these findings that the researcher concludes that low-fidelity simulation is an effective teaching and learning method when best practices are adhered to. The researcher therefore recommends that Simulation activities should be carried out more frequently to enable the students become familiar with case scenarios for better understanding when they occur in real clinical practice.

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**KEYWORDS:** *Low-fidelity, Simulation, Effectiveness, Training, Undergraduate, Nursing, Students, Survey, Buea*

## INTRODUCTION

Different approaches have been used in the definition of simulation by different authors but one thing that these definitions have in common is that simulation is all about an artificial environment. Simulation-based

clinical education in nursing refers to a variety of activities using patient simulators including devices, trained persons, lifelike virtual environments and role-playing, not just handling mannequins (Isenberg

*et al.*, 2005). Gomez & Gomez (1987) refer to simulation as the “art and science of recreating a clinical setting in an artificial location” (Gomez & Gomez, 1987).

Over the last twenty years, simulation for skills training in healthcare education has been evolving at an accelerating rate (Khan, *et al.*, 2011). This has allowed the introduction of new methods of skills training besides the traditional ways. Low-fidelity simulators have been utilized quite effectively by students to practice psychomotor skills in a controlled environment (Seropian *et al.*, 2004). Clinical education in nursing aims to integrate theoretical knowledge from books into practical knowledge in real-life situations and to help students develop their problem-solving skills. Nurses today work in an environment that constantly changes technologically and gets more complicated with patients that have acute and complex health problems. This case leads to the need for nursing students to be prepared in a better manner (Metcalf *et al.*, 2007). Simulation has been shown to be an excellent educational intervention to enhance nursing students’ satisfaction with the learning experience, increase students’ self-confidence, and enhance students’ perception of increased skill performance (Jeffries & Rizzolo, 2006).

### Background to the Study

The training of nurses requires the use of tools such as video cameras, workshops / demonstration rooms, small group learning, simulators among others. Over the last twenty years, simulation for skills training in health care education has been evolving at an accelerating rate (Khan *et al.*, 2011). This has allowed the introduction of new methods of skills training besides the traditional ways. Clinical skills training is a basic and comprehensive part of health care education. In practice-based healthcare professions, methods of teaching and learning focus on enabling students to assimilate clinical knowledge and skills. Besides teaching these skills in clinical placements, educational programs organize modules for skills training. The students practice on each other, on body part models, on cadavers and on anaesthetized patients. Nursing students need to learn how to apply classroom learning in the clinical context. Simulation may well be an educational strategy for achievement of these outcomes as it uses active learning (Cioffi, 2001) applicable to nursing (National Council of State Boards of Nursing, 2005) and has been widely incorporated into international undergraduate nursing curricula (McKenna *et al.*, 2007, NMC UK and Council of Deans for Health, 2007; Murray *et al.*, 2008; Nehring, 2010).

A number of research studies in nursing have evaluated the effectiveness of simulation-based educational interventions (Lasinger, 2008). However, the reported effectiveness has varied according to the fidelity level of the simulators and the outcome variables. Issenberg *et al.* (2005) found that HFS was effective for learning in medicine. However, their review was limited to HFS, medical education, and learner outcome variables, and did not compare simulation methods. Research carried out in the fields of nursing and medicine shows that there is an increase in the use of technology and simulation in these fields and this has been embraced in the effective acquisition of clinical knowledge and assessment of clinical skills (Bradley & Postlethwaite, 2003). Several studies in health care have been conducted to evaluate simulators in relation to learning effects. From the focus on technical development, the learning perspective in skills training simulation is now receiving more attention (Bradley & Postlethwaite, 2003). Tun & Kneebone (2011) are certain that simulation is here to stay and that its role will increase. They believe that simulation introduction offers particular benefits for mastering procedural skills where motor skills are crucial. Simulation has been endorsed by nursing professional bodies (NCSBN, 2005, Murray *et al.*, 2008), educators (Anderson, 2007) and students (Lasater, 2007; Reilly & Spratt 2007, Gardner *et al.*, 2008). There is evidence that it is an effective learning tool, particularly in medicine, where it has been used to train doctors in a wide range of clinical skills tasks from surgical procedures (to patient communication (Kneebone *et al.*, 2002). Simulation engages student in learning and can be designed to increase students’ learning activities independent of faculty. Likewise, simulation can foster a high level of student responsibility in a scenario; something that may not be possible in a traditional clinical setting (Sideras *et al.*, 2013). The transition from carefully controlled educational experiences to a fast paced clinical world of increasing patient complexity requires a strong sense of self confidence, critical thinking, clinical reasoning, and teamwork. Novice registered nurse (RN) graduates must be competent, safe, and efficient in their first job. Within weeks of graduation, they can enter clinical settings where they are expected to assume professional responsibilities and take on patient care assignments. However, there is evidence to suggest that some of these RNs have reported feeling unprepared for the transition to the RN role (Dyes and Sherman, 2009). Accordingly, the Institute of Medicine (IOM) affirms that academic programs should utilize simulation for teaching novice healthcare practitioners the knowledge and

skills needed, especially when introducing new and potentially hazardous procedures and equipment (Kohn *et al.*, 2000).

There are three broad domains in which simulation is used by healthcare professionals. First, simulation techniques can be used for practice and assessment of technical procedures (Aggarwal *et al.*, 2004). This can take a variety of forms ranging from simple bench models to sophisticated virtual reality machines. Second, simulated or standardized patients have long been used to teach clinical skills and are the foundation for performance-based assessment (Harden & Gleeson, 1979). Third, simulation technologies have been used for team training, improving function in tension-filled complex situations (Salas *et al.*, 2008). Simulation based training facilitates skill training without exposing patients to certain risks, enables students to acquire experience without experiencing anxiety and provides a safe environment for learning (Rhodes & Curran, 2005; Tiffen *et al.*, 2011). Simulation based training is also important for teaching staff working with inexperienced students. This technology is important in terms of supporting students in confidently performing their newly acquired skills in a comfortable and supportive environment (Bremner *et al.*, 2006). The simulator provides students reliable skill experience ranging from practices such as basic nursing skills to advanced life support. In addition to this, it also contributes to the development of critical thinking skills and communication skills (Metcalf *et al.*, 2007). The initiation of technology in health education such as simulation can help improve patient's safety with effective improvement of the affective, cognitive, psychomotor skills of student nurses (Gail, 2010). According to Franklin *et al.* (2013) and Frank (2009), with simulations, students are given the opportunity to first practice a particular procedure or exercise in an artificial environment on a simulator before they are exposed to live patients in a clinical setting (Frank, 2009). Despite the aforementioned factors that have been identified to enhance the use of simulation in nursing education, there are some other factors that have been found to impede its use in other parts of the world with Cameroon inclusive: knowledge in its use and cost of the simulators are identified to be relatively expensive (AACN, 2007). In addition to the actual cost of the equipment, consideration must be given to the special training required by the nursing educator as well as the extra time needed to develop an effective simulation experience for nursing students. A typical simulation experience will last 40 minutes (twenty minutes for simulation activity and twenty minutes for reflection) for a group of four to five students

(Jeffries, 2007). To enhance the benefits of the simulation experience, simulations are recommended to be used with small groups (Jeffries, 2007).

Due to rapid changes in clinical placements, patient safety issues, and ethical concerns, students' direct experience with patient care and opportunities to handle problem-based clinical situations have been diminished both nationally and internationally (Rystedt & Lindström, 2001; Gordon *et al.*, 2001; Ziv *et al.*, 2003). Obtaining clinical placements in undergraduate health care education is a challenge which has increased internationally (Schoening *et al.*, 2006; Reilly & Spratt, 2007; Schiavenato, 2009). To meet these challenges, interest in alternative possibilities has emerged. With increased use of computers in health care, and by learning from airline pilot education, simulation was considered a possible tool to develop even in health care education. To start with, the research focus was on technical development and how the simulators could be validated as learning tools. Nursing studies suggest high levels of student satisfaction (Anderson, 2007, Leighton, 2007) but with the risk of anxiety or intimidation (Lasater, 2007) which may influence learning (Jeffries & Rizzolo, 2006).

From the historical background, simulation in the education of health care practitioners is not a new concept. Nehring (2010) notes that as early as 1847, the Handbook for Hospital Sisters called for "every nursing school to have 'a mechanical dummy, models of legs and arms to learn bandaging, a jointed skeleton, a black drawing board, and drawings, books, and models' (p. 34)" (p. 10). Nehring describes Mrs. Chase, the first life-size manikin produced in 1911 for the purpose of nursing education. Over the years, Mrs. Chase underwent modifications and improvements and was joined by a male version and a baby version (Nehring, 2004). In the 1960s, a mannequin called Resusci Anne appeared for cardiopulmonary resuscitation (CPR) training (Hovancsek, 2007). Next came Sim One in 1969 to train anesthesia students (Lapkin, *et al.*, 2010) and then Harvey in the 1980s to train medical students to perform cardiac assessments (Hovancsek, 2007). Since then, tremendous advances in computer technology have provided nurse educators with the ability to design, develop, and implement complex learning activities in the academic setting. Nursing simulation with sophisticated computerized manikins began in the late 1990s and early 2000s (Hovancsek, 2007; Nehring, 2004).

### Statement of the Problem

The challenges facing nursing education in the 21<sup>st</sup> century are numerous. Universities that offer nursing



and midwifery are faced with increased intakes, decreased clinical placements and a weak patients' availability. As a result of the shortage of these clinical sites, student nurses are competing with other learners in hospitals to gain the essential knowledge and skills to become a registered practitioner. Concerns have been raised regarding the variation in competence following different types of training and education. In training and education, undergraduate students must begin gaining practical skills in skills laboratories using simulations. It is important to check if students are aware of simulations, practice with them before being exposed to real patients. The regularity of use of simulations is questionable, their effectiveness and level of knowledge acquisition may also be limiting requiring investigation together with what subject matter is best taught through simulations. Although the majority of research regarding the utilization of simulation has been performed in medical settings showing they are educationally effective, similar studies are limited in nursing and thus a need for additional evidence that supports the use of this technology in nursing education. Based on anecdotal reports, there are some mannequins that can produce the same effectiveness as the high priced simulators requiring computer technologies for functioning. Thus, this study aims to assess the effectiveness of low-fidelity simulation since it is the main simulation technique being used in most institutions in the area of the study.

### **General Objective**

The aim of this study is to examine the effectiveness of low-fidelity simulation technology in the training of nursing students.

### **Specific Objectives**

- Assess nursing students' knowledge on low-fidelity simulation in their training.
- Appraise the use of simulation in the training of nursing students in Buea municipality.
- Examine how frequent simulations are used in the training of these students.
- Investigate the effectiveness of low-fidelity simulation in the training nursing students in Buea municipality.

### **Significance of the Study**

#### **To students**

Use of simulation as an instructional technology holds great promise for nursing education. Simulation can become an integral part of nursing education because of its ability to improve patient care and safety by optimizing outcomes, providing a means of allowing nursing students to "practice" critical thinking, clinical decision making, and psychomotor skills in a safe, controlled environment, without

potential risk to a live patient. It will help enhance learning because the time spent in a well-structured simulation experience can be powerful and far outweigh what can be accomplished in a traditional clinical conference. As such, the simulation experiences may be used instead of a clinical setting.

#### **To nurse educators**

Nurses are expected to provide safe and competent nursing care after graduation and throughout their professional careers. Simulation will serve as an alternative method to nurse educators in teaching and assessing decision making in their nursing students as a result of the challenges of the current clinical environment.

#### **To school administration**

Training institutions will become more aware of the advantages of educating students with patient simulation, thereby increasing its utilization in educational programs, since errors can be allowed and corrected without concern for patient safety.

Schools of nursing will optimize the use of patient simulation and increase its cost-effectiveness by incorporating it into undergraduate, graduate and continuing education programs. As enrolments in schools of nursing are rising, there is increased competition for clinical sites. The use of simulation is one means of providing clinical learning experiences outside the health care institutional setting.

### **Scope of the Study**

This study focused more on simulations especially low-fidelity simulation and not the other forms of simulation. This is because low-fidelity simulation is the only fidelity of simulation being used in the training of nursing students in Buea municipality. These low-fidelity simulations include; case studies, role playing, partial and standardized patients. The study did not pay much attention to the other forms of technologies which are used in training nurses.

### **Operational Definition of Terms**

The following terms have been defined as used in the study.

#### **Simulation**

Simulation is an active learning strategy that uses devices or techniques to develop an environment that closely represents a clinical setting as well as provides educators safe, hands-on approaches to teaching and assessing psychomotor, communication and critical thinking skills (Blevins, 2014). Simulation is a dynamic process involving the creation of a hypothetical opportunity that incorporates an authentic representation of reality, facilitates active student engagement and integrate the complexities of practical and theoretical learning with

opportunity for repetition, feedback, evaluation and reflection (Bland, Topping & Wood, 2011. p.668).

### **Simulator**

It is one that simulate, especially a device that enables the operator to reproduce or represent under certain test conditions phenomena likely to occur in actual performance (Merriam Webster dictionary). It is a device designed to replicate some aspects of the real life and can be manipulated to observe the outcomes of different actions without exposing the one being observed in any danger or risk.

### **Low Fidelity**

These are experiences such as case studies, role-playing, using partial task trainers or static mannequins to immerse students or professionals in a clinical situation or practice of a specific skill (NLN-SIRC, 2013).

### **Training technology**

It refers to methods, systems, and devices which are the result of scientific knowledge being used in an organized activity aimed at imparting information and/or instructions to improve the recipient's performance or to help him or her attain a required level of knowledge or skill.

### **Effectiveness**

It is a noun meaning the degree to which something is successful in producing a desired result; success.

### **Acquisition of knowledge**

Knowledge acquisition is the process of absorbing and storing new information in memory, the success of which is often gauged by how well the information can later be remembered (retrieved from memory). The process of storing and retrieving information depends heavily on the representation and organization of the information.

### **Confidence**

It is the formation of professional confidence through knowledge acquisition, experiences, and critical thinking (Leigh, 2008).

### **Methodology**

#### **Research Design**

The study is backed by a cross-sectional descriptive survey design with a concurrent nested mixed-method approach whereby data were collected using a semi-structured questionnaire.

#### **Area of Study**

This research was carried out in Buea municipality which is the sub-divisional headquarter of Buea found in Fako Division, Southwest Region Cameroon. Buea, the seat of the University of Buea, is a small historic town located at the foot and eastern slopes of Mount Cameroon, the highest mountain in west and

central Africa with a surface area of 870 Sq.km, 67 villages, four distinct identified urban spaces as per outlined criteria (Buea station, Soppo, Molyko/Mile 17 and Muea). The main occupations of the people are farming, skill and unskilled works, and clerks. It has several institutions training nurses at the degree level whereby the Faculty of Health Sciences of the University of Buea which is a government institution is supported by private ones.

### **Population of the study**

The population of this study is constituted of undergraduate nursing students whereby those who were in their fourth year of study were targeted, since they must have had some simulations.

### **Sample**

The sample was made of 90 students. The students included in the study were those willing to participate in the fourth year of their studies and available at the time of data collection. Those excluded were non-consenting individuals. Also, incomplete test items were excluded.

### **Sampling Techniques**

Selection of schools was by double-stage sampling whereby stratified sampling technique was used to sample public and private nursing schools in Buea municipality while within stratum the entire cohort of fourth year students was purposively targeted.

Selection of subjects was by a purposive sampling technique. This allowed only for the inclusion of fourth-year nursing students enrolled in the degree program in Buea municipality in the study whereby the entire cohort in the sampled institutions was targeted. Faculty of Health Sciences, University of Buea, Biaka School of Nursing, Higher Institute of Applied Medical Sciences (HIAMS) and Saint Monica University were sampled (table 1).

### **Data Collection Instrument**

The instruments used was a semi-structured questionnaire The language was clear to meet the level of understanding of the respondents in order to generate needed responses as confirmed by the face validity exercise. Also, the questions were both open-ended and close-ended for the respondents to have a chance of expressing their views as well as choose from the given alternatives respectively.

### **Validity and Reliability of Instrument**

Construct validity was checked by ensuring that the indicators under investigation relate with one another in a way that is consistent with the theoretical perspective.

To ensure content validity, the questionnaire was scrutinized by the researcher, her supervisors, a

colleague and the statistician to make sure the indicators were adequately labelled and could appropriately measure the characters under study. Generally, above 0.75, CVI is satisfactory (Nana, 2015) and in the context of this study, the judges validated the final instrument making a CVI of 1.

To ensure face validity which is the kind ascertained when little or nothing is known about the research variables, the questionnaire was checked by judges listed earlier, and students and teachers during the trial testing of the instrument for clarity and visibility.

Prior to the full study, a pilot study was conducted with a school in Bamenda that had the same characteristics as the population of the study. This study was carried out in order to ascertain the validity of the instruments used for data collection and ensuring a good face validity, internal consistency or reliability of the responses.

### Data collection process

An authorization to carry out the study was obtained from the Faculty of Health Science of the University of Buea. This authorization was presented to the heads of institution for administrative clearance. Students were then briefed on the objective of the study, their consent sought, and they were then given the questionnaire to fill. Their level of instruction was appropriate for self-administration. In this study, data were collected from 85 nursing students. The purposively estimated sample targeting all the eligible subjects within the study area was 90 thus making a return rate of 95%. Five students were not available during data collection.

### Method of data processing and analysis

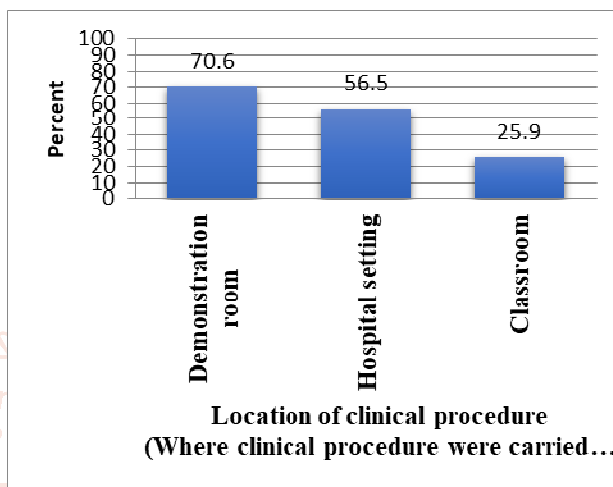
Quantitative data were entered using EpiData Version 3.1 (EpiData Association, Odense Denmark, 2008) and analyzed using the Statistical Package for Social Sciences (SPSS) Standard version, Release 21.0 (IBM Inc. 2012). The questionnaire was made of categorical variables and data were analyzed using counting techniques namely frequency and proportions while Multiple-Responses- Analysis was used to calculate the aggregate score for conceptual components (Nana, 2015). Cramers' V test was used to test for significance level in the measurement of association. All the statistics were discussed at the 95% Confidence Level (Alpha =0.05) and presented in table, charts and prose writings.

Open-ended questions were analyzed using the process of thematic analysis whereby concepts or ideas were grouped under umbrella terms or key words. New concepts generated from thematic analysis process were added to the initial indicators and integrated in the quantitative analytical process.

## Findings

### Students' knowledge on low-fidelity simulation Have been taught clinical procedures in the program practically:

All student nurses making a proportion of 100% (85) have being taught clinical procedures in their program practically. The clinical procedures were mostly carried out in demonstration room 70.6% (60), followed by hospital setting 56.5% (48) then classroom 25.9% (22) being the least (figure 1).



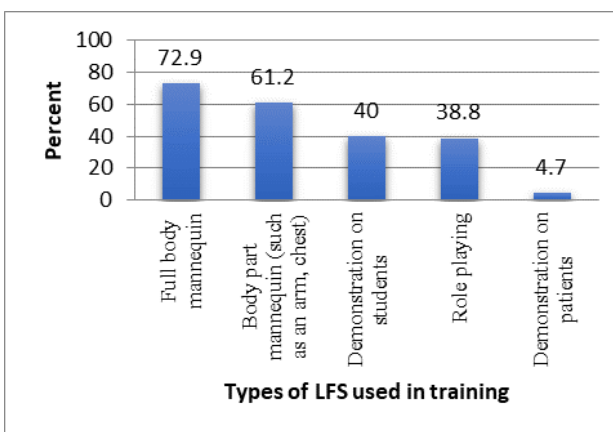
**Figure 1: Distribution of respondents with respect to where clinical procedure were carried out**

### Knowledge of mannequin:

Student nurses generally know what a mannequin is with a proportion of 94.1% (80) with only 5.9% (5) not knowing what a mannequin is.

### Types of LFS used in training nursing students:

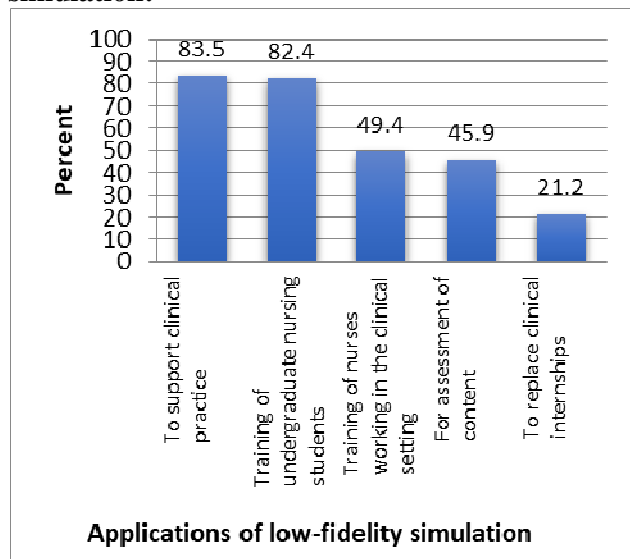
The results (figure 2) showed that full body mannequin was the type that was the most used in clinical procedure 72.9% (62), followed by body part mannequin such as arm or chest 61.2% (52), demonstration on students 40% (34), role playing 38.8% (33), then demonstration on patients, being the least employed 4.7% (4).



**Figure 2: Distribution of respondents with respect to types of LFS used in training**



**Knowledge acquisition and confidence in simulation:**



**Figure 3: Distribution of respondents with respect to student nurses' perceived application of low-fidelity simulation**

It was mostly perceived that low-fidelity simulation was mostly used to support clinical practice 83.5% (71) followed by the use in the training of undergraduate nursing students 82.4% (70), training

of nurses working in the clinical setting 49.4% (42), for assessment of content 45.9% (39) and to a very low extent to replace clinical internship 21.2% (18) as presented on figure 3.

Student nurse were generally satisfied with the abilities acquired during simulation activities (86.0%). Their rate of satisfaction range from 96.5% (82) for the application of previously acquired knowledge, 91.8% (78) for the application of content evident in nursing care, 87.1% (74) for the development of confidence in preparation of nursing care, 83.5% (71) for the recognition of existing needs of a patient and feeling prepared for role as a nurse, 82.4% (70) for prioritization of the existing needs of a patient to 77.6% (66) for the communication of relevant patient care (figure 3).

The perceptions of student nurse in relation to the applications of low-fidelity simulation did not differ significantly between those who worked as nurse before enrolling in the program and those who did not (table 2), respectively for the indicators 'Training of undergraduate nursing students', 'Training of nurses working in the clinical setting', 'For assessment of content', 'To replace clinical internships' and 'To support clinical practice' (P>0.05).

**Table 2: Distribution of respondents according to perceived application of low-fidelity simulation by having worked as a nurse before enrolling in this program**

Application of low-fidelity simulation	Stats	Worked as a nurse before enrolling in this program		Cramer's V
		Yes	No	
Training of undergraduate nursing students	n	29	41	V=0.137 P=0.449
	%	82.8%	82.0%	
Training of nurses working in the clinical setting	n	15	27	V=0.239 P=0.088
	%	42.8%	54.0%	
For assessment of content	n	16	23	V=0.126 P=0.510
	%	45.7%	46.0%	
To replace clinical internships	n	9	9	V=0.219 P=0.131
	%	25.7%	18.0%	
To support clinical practice	n	28	43	V=0.143 P=0.418
	%	80.0%	86.0%	
Total		35	50	

**Table 3: Distribution of respondents with respect to perceived application of low-fidelity simulation by currently working as a nurse in a clinical setting**

Application of low-fidelity simulation	Stats	Currently working as a nurse in a clinical setting		Cramer's V
		Yes	No	
Training of undergraduate nursing students	n	23	47	V=0.159 P=0.340
	%	82.1%	82.4%	
Training of nurses working in the clinical setting	n	11	31	V=0.339 P=0.008
	%	39.3%	54.4%	
For assessment of content	n	12	27	V=0.145 P=0.411
	%	42.8%	47.4%	

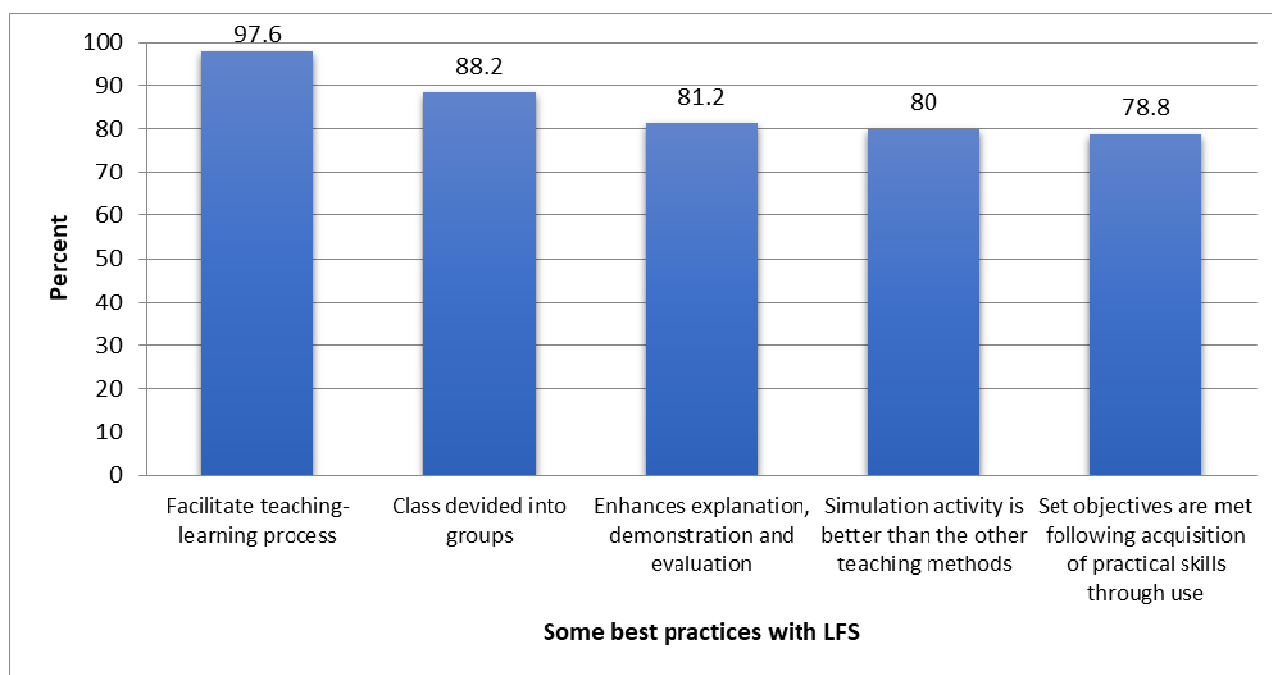
To replace clinical internships	n	6	12	V=0.157
	%	21.4%	21.0%	P=0.329
To support clinical practice	n	21	50	V=0.161
	%	75.0%	87.7%	P=0.332
Total		28	57	

Those students not currently working in a clinical setting were more of the opinion that low-fidelity simulation can be used to train nurses in the clinical setting with proportion of 54.4% (31) as against 39.3% (11) for those currently working in a clinical setting (P<0.05). As for the other applications, their perceptions did not differ significantly (P>0.05), as presented on table 3.

**The effectiveness of low-fidelity simulation in the training of nursing students:**

From figure 4, it is realized that simulation is important in the teaching/learning process as pointed out by 97.6% (83) of the nursing students.

A good number of the participants acknowledged good practices such as class being divided into groups during practical lessons 88.2% (75), brief explanation of the procedure, demonstration of procedure by facilitator, practice by student and evaluation by facilitator being done 81.2% (69), simulation activity perceived better than the other teaching method 80% (68), they also recognized that set objectives were met following acquisition of practical skills through use mannequins 78.8% (67).



**Figure 4: Student nurse perceived effectiveness of simulation as training technology amongst undergraduate nursing students**

**Table 4: Participants’ perceived effectiveness of LFS**

Abilities	Not effective	Somehow effective	Undecided	Effective	Very effective	Collapsed	
						Not effective	Effective
Skill acquisition	3.5% (3)	2.4% (2)	3.5% (3)	58.8%(50)	31.8% (27)	5.9% (5)	90.6% (77)
Creativity in learning	1.2% (1)	2.4% (2)	3.5% (3)	51.8%(44)	41.2% (35)	3.5% (3)	92.9% (79)
Development of interpersonal relationship skills	3.5% (3)	4.7% (4)	3.5% (3)	55.3%(47)	32.9% (28)	8.2% (7)	88.2% (75)
Learning about the topics	1.2% (1)	0% (0)	12.9% (11)	55.3%(47)	30.6% (26)	1.2% (1)	85.9% (73)
Transfer of knowledge	3.5% (3)	4.7% (1)	8.2% (7)	64.7%(55)	22.4% (19)	4.7% (4)	87.1% (74)



Interest in the subject	4.7% (4)	2.4% (2)	14.1% (12)	47.1%(40)	31.8% (27)	7.1% (6)	78.8% (67)
Flexibility (openness) in learning	1.2% (1)	1.2% (1)	5.9% (5)	57.6%(49)	34.1% (29)	2.4% (2)	91.8% (78)

Student nurses were generally satisfied with simulation as method of clinical practice. The proportions expressing their levels of satisfaction ranged from 92.9% (79) for those who found low-fidelity simulation to be effective in creativity in learning, 91.8% (78) for those who perceived that it allowed for flexibility (openness) in learning, 90.6% (77) for effectiveness in skill acquisition, 88.2% (75) for those who acknowledged that it resulted in development of interpersonal relationship skills, 87.1% (74) for those believing that it for transfer of knowledge, 85.9% (73) for those who were of the opinion that it assisted learning about the topic while 78.8% (67) perceived that it increased their interest in the subject as depicted by table 4 presenting both stretched and collapsed trends.

### Frequency of use of simulation in training

#### Where first practical skills were carried:

The first practical skills were carried mostly on fellow students 30.6% (26), followed by live patients in the hospital 29.4% (25), mannequins 25.9% (22), then mode such as orange or potato 14.1% (12) as presented on figure 5.

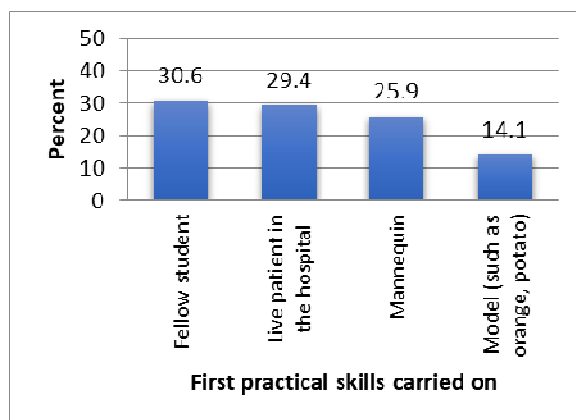


Figure 5: Where first practical skills were carried

#### Level where first low-fidelity simulation was done

Table 5: Level where first low-fidelity simulation was done

Level	Frequency	Percent	Cumulative Percent
First year	37	43.5	43.5
Second year	31	36.5	80.0
Third year	6	7.1	87.1
Fourth year	11	12.9	100.0
Total	85	100.0	

Student nurses mostly did their first low-fidelity simulation in their first year of training 43.5% (37), followed by second year 36.5% (31), and to a very low extent during the fourth year 12.9% (11) and the third year 7.1% (6) as depicted by table 5.

#### Change in skill over time:

Student nurse generally perceived that practice of clinical skill increased as they progressed from one level to the other 95.3% (81) as presented on table 6.

Table 6: Perceived change in practice of clinical skill as student nurses move from one level to the other

	Frequency	Percent
Yes	81	95.3
No	4	4.7
Total	85	100.0

### Frequency of participation in simulation over level:

The frequencies of participation in simulation increase over time. In year one, it was mostly once a month 57.6% (49) and only 5.9% (5) said it was done 2-3 times a month, while the proportion of those who said it done 2-3 times per month increased to 40.0% (34) in year two, while the proportion of more than 3 times per months move from 5.9% (5) in year two to 29.4% (25) in year three and almost double to 51.8% (44) in year four. As those that said it was never done, the proportion decreased from year one to years three before increase in year 4 thus implying that simulation is mostly done in the intermediary years. These statistics are graphically presented on figure 6.

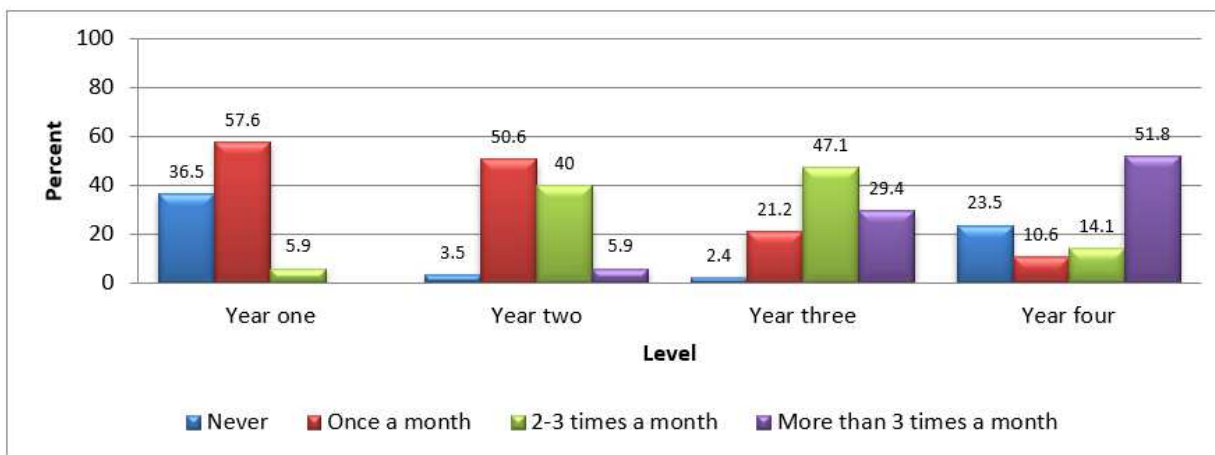


Figure 6: Frequency of participation in simulation over level

### Nursing students' perceptions on simulation

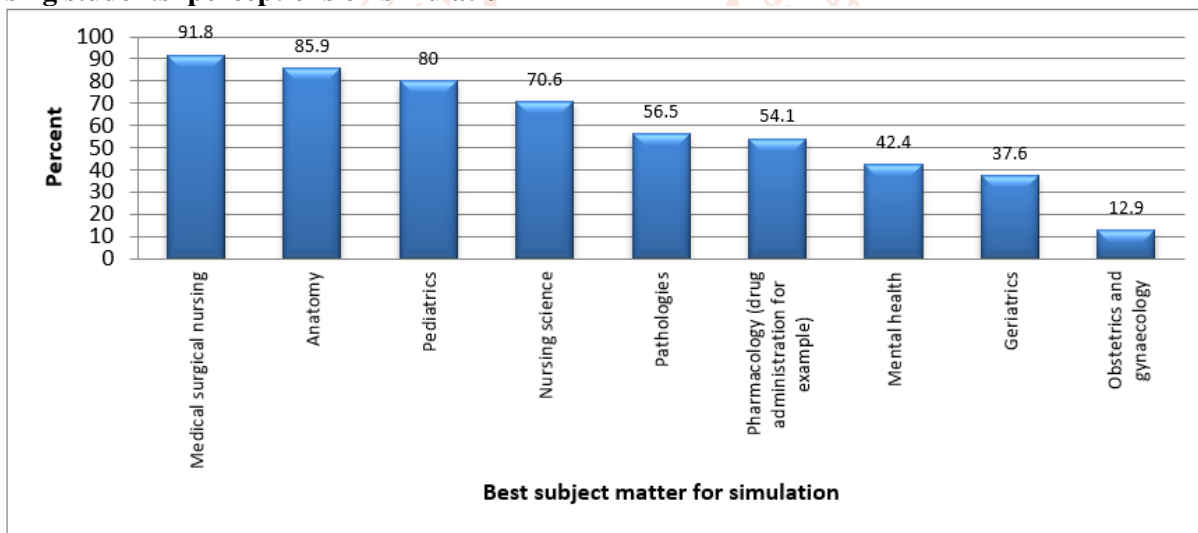


Figure7: Student nurses' perceived best subject matter for simulation

Medical surgical nursing was perceived the best subject matter for simulation 91.8% (78), followed by anatomy 85.9% (73), pediatrics 80% (68), nursing science 70.6% (60), pathology 56.5% (48), pharmacology 54.1% (46) while less than the majority opted for mental, geriatrics and obstetrics and gynaecology with proportions of 42.4% (36), 37.6% (32) and 12.9% (11) respectively (figure 7).

### Discussion

#### Student's knowledge on low-fidelity simulation

findings revealed that as far as the use of simulation in nursing education is concerned, all the students (100%, 85) have been taught clinical procedures practically since clinical skills training is a basic and

comprehensive part of health care education (Khan *et.al.*, 2011). These clinical procedures were carried out mostly in demonstration rooms as stated by majority of the students (70.6%), followed by hospital setting (56.5%) with a few stating the classroom (25.9%). This corresponds to a study by Gail in 2010 who stated that the integration of simulation in nursing education is expected to start in the classroom where the concepts and theories are introduced with the use of role modeling. After that, students are taken into a skill laboratory which is composed of mannequins and clinical equipment for them to learn practical skills and relate to practice in the real world. Also, Dieckmann (2009) warns against placing too

much emphasis on having optimal equipment and surroundings that realistically replicate the clinical setting. Majority of the students (94.1%) had knowledge on mannequin. These students generally knew what a mannequin was, pointing out that they have been trained in using mostly full body mannequins (72.9%), with demonstration on students being least employed (4.7%). In fact, simulation in the education of health care practitioners is not a new concept. Nehring (2010) notes that as early as 1847, the Handbook for Hospital Sisters called for “every nursing school to have ‘a mechanical dummy, models of legs and arms to learn bandaging, a jointed skeleton. According to Bray, *et.al*, (2009), these are scenarios that offer students a chance to practice inter-professional teamwork principles which are widely encouraged as a method to improve patient care and safety. Authors such as Aldrich (2004) had seen role play as a relatively low-fidelity beneficial, especially in the realms of team training and/or change in attitudes. Demonstration on patients was found not too frequent as compared to body part and full body mannequins in this study. This does not tie with Shemanko & Jones (2008) who have opined that the use of standardized patients has been found to help students gain self-awareness of their communication and clinical strengths and weaknesses, their reactions to stressful situations, and also their biases. With respect to knowledge acquisition and confidence in simulation, majority of the students expressed satisfaction with abilities acquired during simulation activities. For instance, majority of the student nurses (96.5%) can effectively apply their previous knowledge, apply content evident in nursing care (91.8%), recognize and prioritize the existing needs of patients (83.5%), and can effectively communicate relevant patients care data (77.6%). Traditionally, simulation is a teaching method that closely replicates reality by integrating all three learning domains: cognitive, affective, and psychomotor domains. Simulation in nursing education has been an effective tool in promoting knowledge and skills acquisition in a safe learning environment. Risks to patients due to student inexperience are avoided (Tschannen *et al.*, 2012). Also, simulation can help students develop the ability to apply previously learned knowledge in novel situations (knowledge transfer) when compared to other forms of education and provides opportunities for students and nurses to engage in deliberate practice using evidence-based guidelines (Scherer *et al.*, 2007). Accordingly, findings in the study conducted by Schlairet & Pollock (2010) on nursing students showed that simulation is a method equivalent to clinical placement in terms of

knowledge acquisition. Furthermore, majority of the student nurses (87.1%) have developed confidence in preparation of nursing care as well as feel prepared to take the challenge as a nurse. Weaver (2011) in his study revealed that though stimulations were beneficial to students, the findings further highlighted students’ confidence and knowledge transfer. Harder (2010) also postulates that indeed, when students have self-confidence, they are more inclined to be assertive and to demonstrate knowledge and skills, thereby improving performance. This performance reassures the students and gives them even more self-confidence. In addition to this, simulation has been shown to improve students’ level of confidence

### **Use of low-fidelity simulation in training nursing students**

Durham & Alden (2008) cite the Institute of Medicine’s (IOM) recommendation for institutionalizing simulation as a method of teaching effective responses to complex and high risk situations encountered in clinical practice. Low fidelity simulation had been perceived by student nurses as instrumental in their training for instance, majority of the students (83.5%) in this study seeing it good in supporting clinical practice. This is in line with a study carried out by Gomez & Gomez (1987) who stated that simulation is an adjunct to clinical environment as it gives room for conscious practice in an environment that is controlled either by an expert or a more experienced person. Other situations in which simulation could be used in nursing education were in the training of undergraduate nursing students (82.4%) and training of nurses working in the clinical setting (49.4%). The minority of the students 21.2% (18) pointed out that simulation should replace clinical internship. This is in line with Hovancshek (2007) who stated that simulation-based educational interventions in nursing can train novice as well as experienced nurses, helping them develop effective non-technical skills, practice rare emergency situations and providing a variety of authentic life threatening situations. Also, results of the recent nationwide simulation study indicated that most of the traditional clinical learning experiences can be effectively substituted by simulations under the right conditions (Hayden *et al.*, 2014).

### **Effectiveness of low-fidelity simulation in the training of nursing students**

Following the findings of this study, a strong majority of the students acknowledged good practices such as class being divided into groups during practical lessons (88.2%). This was to enable that students exposed to the simulation activity are few to ease follow-up by the instructor. This is in line with

Jeffries (2007) who stated that to enhance the benefits of the simulation activity, simulations are recommended to be used with small groups and that a typical simulation experience will last 40 minutes (twenty minutes for the simulation activity and twenty minutes for reflection) for a group of four to five students. Majority of the students also noted that the simulation activity was carried out following brief explanation of the procedure, demonstration of procedure by facilitator, practice by student and evaluation by facilitator being done (81.2%). Lynne in 2009 stated that skills learning can be seen as a hierarchy. The trainer needs to possess the skills necessary to move the learner from a baseline level of awareness and knowledge of a particular skill through the higher levels of showing an ability to perform the skill and ultimately to their achieving mastery. In addition to this, Beaubien & Baker in 2004 agree that the scenario typically begins with a pre-brief, followed by the execution of the task and concludes with the instructor leading a review of the event in a debrief session. To a very low extent, students stated that the simulation activity was not followed by feedback from the trainer. This is opposed by Kohn *et al.* in 2000 who stated that simulation is a training and feedback strategy where one learns to develop and apply the knowledge and skills to create lifelike circumstances of the real world and receive feedback to assist in improving and refining to meet educational needs. To this light, students generally perceived the simulation activity as better than the other teaching methods (80%). This could be because within the simulation setting, different teaching components comprise the “best practice” for skills training amongst it are feedback and repetitive practice as key factors of effective simulation (Issenberg *et al.*, 2005). In line with this according to Peyton (1998), instructional methods like Peyton’s four-step model provide reliable and yet quite popular teaching methods including demonstration, deconstruction and comprehension, thus making simulation better. The students also recognized that set objectives were met following acquisition of practical skills through use of mannequins (78.8%), as such; student nurses generally (97.6%) will recommend the use of low-fidelity simulation in learning. This is in line with Baillie *et al.* (2009) and Sideras *et al.* (2013) who stated that simulation engages student in learning and can be designed to increase student learning activities independent of faculty. Likewise, simulation can foster a high level of student responsibility in a scenario, something that may not be possible in a traditional clinical setting. When students are involved in the teaching/learning process, they become responsible for their learning

ensuring that their set objectives are met thus will easily recommend to other students. In addition to this, Murray *et al.* (2008) stated that educators apply well founded simulation approaches not only to help students in clinical rotations to attain educational goals, but also to evaluate teaching methods as well as to investigate alternatives to the goals and methods themselves. Overall, students perceived low-fidelity simulation as effective in their training in aspects such as transfer of knowledge from theory to practice, acquisition of practical skills as well as development of interpersonal relationships between the facilitator and their peers enabling flexibility and a stress free environment, thereby enhancing learning.

### **Frequency of use of simulation in the training of nursing students**

Most students carried out their first practical skills on fellow students 29.4% (25), with a few on models such as orange or potato 14.1% (12). This is in line with Cioffi (2001) who stated that in practiced-based healthcare professions, methods of teaching and learning focus on enabling students to assimilate clinical knowledge and skills. Besides teaching these skills in clinical placements, educational programs organize modules for skills training. The students practice on each other, on body part models, on cadavers and on anesthetized patients. To this effect, Frank *et al.* (2009) stated that students are given the opportunity to first practice a particular procedure or exercise in an artificial environment on a simulator before they are exposed to live patients in a clinical setting. Student nurses mostly did their first low-fidelity simulation in their first year of training (43.5%) and to a very low extent during the third year 7.1% (6). This could be because students need to be introduced to clinical procedures early enough for them to have an idea of what is expected of them throughout their training since nursing is a practice based profession.

These students generally perceived that practice of clinical skill increased as they progressed from one level to the other (95.3%). In year one, it was mostly once a month (57.6%), increasing to 2-3 times a month (40.0%) in year two, then to more than three times a month in year three (29.4%) and year four (51.8%). This is in line with a study by Lambton (2008) who reported that students wished to have more simulation experiences to maximize their development and they were generally satisfied with replacing a moderate percentage of their clinical hours with simulations. Also, in an experimental study conducted by Karadag *et al.* (2012) to determine the impact of simulation on the development of expertise, including monitoring vital



signs and performing physical assessments, results showed that students in the experimental group were better able to demonstrate the techniques compared to the students in the control group. From the findings of these researchers, use of simulations in the training of student nurses cannot be over emphasised. Therefore, it is imperative for simulations to be frequently used in the training of student nurses at all levels.

### Conclusion

Nursing schools prepare learners to face the realities of the complex health-care arena the learners will enter upon graduation. Nurse educators are continually seeking educational strategies that will increase the abilities of a graduate to transition successfully into the professional nursing role. Findings revealed that nursing students were knowledgeable on the uses of low-fidelity simulation; low-fidelity simulation technology met the set objectives of simulation activities despite its low reality with transfer of knowledge from theory to practice indicating increasing frequency of use in training from once a month in the first year (57.6%) to more than three times a month in the fourth year (51.8%). Also, it was identified from the results that learners enjoyed participating in simulations and find them rewarding and educationally satisfying coupled with the numerous advantages of simulation brought forward by the students, such as facilitation of knowledge and practical skills acquisition, instilling self-confidence; nursing students are more likely to function as professionals with limited or no significant constraints as well as attending to patient needs. Thus, it is based on these findings that the researcher concludes that low-fidelity simulation is an effective teaching and learning method when best practices are adhered to.

### Recommendations

Based on the above findings, the following specific recommendations are put forward.

- Faculty should make provision of mannequins for simulation and teachers should endeavour to use the available ones in maximizing learning as well as look for means of incorporating the intermediate as well as the high-fidelity simulations with high levels of reality in their classrooms.
- Nurse educators are requested to engage fully in debriefing activities following simulation to maximize the learning outcome as well as identify challenges faced by students and their weaknesses for amelioration.
- Simulation activities should be carried out more frequently to enable the students become familiar

with the case scenarios for better understanding when they occur for real in clinical practice.

- Simulation activities should be incorporated in all courses requiring nursing students to develop knowledge, practical skills so as to gain experience in all aspects of their training.

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