

## Effectiveness of High Fidelity Simulation versus Traditional Clinical Teaching Strategies on Undergraduate Nursing Students' Achievement

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DOI: <http://dx.doi.org/10.15520/ijnd.2016.vol6.iss7.161.01-13>

**Abstract:** The increasing use of technology in healthcare, higher public and patient expectations have both encouraged the development and use of innovative educational methods in healthcare education. This study aimed to evaluate the effectiveness of High Fidelity Simulation versus Traditional clinical Teaching Strategies on Undergraduate Nursing Students' Achievement. **The study** was carried out in **Faculty of Nursing, Tanta University**: A purposive sample of 200 students were selected and divided into two equal groups with 100 students in each one. **Research hypotheses:** **H1:** The total practice score of High Fidelity Simulation group will be improved more significantly than the traditional one.

**H2:** satisfaction and self confidence of high fidelity simulation group will be significantly higher than the traditional one. **Tools of the study:** Three tools were used. **Tool I: Students' structured interview questionnaire.** It consisted of two parts: **Part A: Students' sociodemographic data.** **Part B: Students' knowledge questionnaire,** to assess the 2nd degree nursing students' knowledge regarding cardiovascular, respiratory and urinary systems. **Tool II: Student's performance observational checklist** to assess students' performances in relation to cardiovascular, respiratory and urinary assessment. **Tool III: Students' satisfaction and self confidence.** **Results:** Total mean score of knowledge among study group II was (10.19±1.796) compared to the study group I (8.41±1.349). Also, the majority (97 %) of study group I had poor practice score compared to only 9 % of study group II. More than two thirds (68 %) of study group I had low satisfaction score compared to only 9 % of studied group II. On the other hand, only one fifth (20 %) of studied group I had high level of satisfaction compared to more than half (58 %) of studied group II. Also, more than two third (61.0%) of study group I had low self-confidence score compared to none of study group II. about 44.0% of study group II had high level of self-confidence score compared to only 4.0% of the study group II.

**Conclusion:** Slight improvement in total knowledge and practice scores were observed among undergraduate students of High Fidelity Simulation compared to the traditional teaching strategy. Also, satisfaction and level of self confidence were statistically improved.

**Based on findings of the study it is recommended** for nursing educators to emphasize using the most recent and innovative approaches especially simulation teaching strategies especially for clinical areas to mimic the reality of a clinical environment.

**Key words:** High Fidelity Simulation (HFS), Traditional clinical Teaching Strategies, Nursing Students' Achievement.

### INTRODUCTION

Education for nursing students in Egypt can be challenging. The increasing use of technology in healthcare, higher public and patient expectations have both encouraged the development and use of innovative educational methods in healthcare education. Therefore, Interactive teaching tools are utilized by nursing faculty members to improve nursing student's knowledge and skills (1) Fidelity simulation has traditionally been defined as 'the degree to which the simulator replicates reality. Simulators are labeled as either "low" or "high" fidelity depending on how closely they represent 'real life' (2).

Moreover, nursing education is influenced by a number of factors including; the widespread use of new technologies, the serious shortage of nurse faculty, and the realization that today's nursing students are a diverse group with different learning styles (3).

A 2010 survey of 1060 nursing programs in the United States revealed that 87% were using simulation and 55% were using it in five or more courses (4).

Traditional methods of nursing education need to give way to more innovative approaches to prepare graduate nurses

with competent experiences for their future nursing practice(3). Therefore, the use of fidelity simulation in health care education is becoming a foundation for many undergraduate nursing programs (5).

The National Council of State Boards of Nursing (2009) defines simulation as "activities that mimic the reality of a clinical environment and they are designed to demonstrate procedures, decision - making, and critical thinking through techniques such as role playing and use of devices such as interactive videos (6).

Simulation is a teaching method as well as a technology. One method that has been found to be effective is High Fidelity human patient Simulation (HFS). It is a teaching strategy that complements the traditional teaching experience and enabling students and healthcare professionals to learn in an environment that eliminates the risks for actual patients. In addition it enables the nursing students to practice newly developed skills in a risk-free environment, and to have immediate feedback from experienced faculty members (7,8).

As regard, HFS has a lot of benefits in professional training. It is realized in safe, controlled and realistic environment of simulation laboratories reflecting real hospital and

community care environment with no risk of harming real patients and optimize outcomes of care. In addition, it is used to train individuals in the context of team activities, creating more realistic clinical environment (9, 10).

Patients who are admitted to the hospital have the right to believe that they will receive the best care. Recognition of patient's deterioration and referring to critical care is a highly complex process, requiring knowledge, skill, experience and confidence (11).

Simulation-based training involves immersion of the graduate student in a realistic situation and medical environment. During participation in such situation, nursing students observe the performance of peers in managing medical events. Graduate students who participate in such type of training must feel free to make errors without the risk of liability or employment consequences. Simulations provide students with an opportunity to practice their skills in a safe environment, allowing for skill refinement with repeated exposure over time (12).

The importance of early exposure of undergraduate nursing students has been recognized, and more integration of clinical experiences has been introduced in the curriculum. Providing students with early and extensive clinical experiences during their training is crucial. The identified benefits of early clinical exposure were related to the following themes: the relationships and learning in early encounters with patients, integration with learning during the entire curriculum, and personal and professional growth. These aspects provide unique opportunities for nursing students to learn in an appropriate context (13).

Nursing programs aim to produce graduate nursing students proficient in making critical decisions regarding the care of patients. In addition, health care administrators expect novice graduate students to perform with a higher degree of clinical competence that impacts the quality of patient care, improves patient' outcomes, and enhances self confidence. Additionally Members of faculty of nursing have been met with pressures from administrative agencies and accreditation bodies to incorporate simulation into their nursing curriculum because of the potential effectiveness of the training approach (14). Some simulation training take place on an actual hospital, within a patient care setting, using certified medical equipment from that setting. This may be done to identify and resolve key systemic errors within that unit and improve patient care and safety. Also, some simulation exercises are conducted to assess performance and knowledge (15).

**Therefore**, the aim of this work was to evaluate the effective of High Fidelity Simulation versus Traditional Teaching Strategies on undergraduate nursing students' achievement in Skill Lab.

#### **Significance of the study:**

Graduate nursing students who participate in traditional training have the risk of harming the real patients with the risk of liability or employment consequences. Simulations provide students with an opportunity to practice their skills

in a safe environment, allowing for skill refinement with repeated exposure over time (12).

## **SUBJECTS & METHOD**

**Aim of the study:** To evaluate the effectiveness of High Fidelity Simulation versus Traditional clinical Teaching Strategies on Undergraduate Nursing Students' Achievement

#### **Research hypotheses:**

**H1:** The total practice score of High Fidelity Simulation group will be improved more significantly than the traditional one.

**H2:** satisfaction and self confidence of High Fidelity Simulation group will be significantly higher than the traditional one.

#### **Operational definitions:**

1. **High-Fidelity Simulation:** means the use of a technologically advanced and computerized mannequin (the Laerdal SimMan high fidelity simulator). The simulator is anatomically precise and reproduces physiologic responses in which the students are administered cardiovascular, respiratory and urinary assessment that resemble a clinical setting. The researchers can control the mannequin's responses.
2. **Nursing Students' Achievement:** means measuring knowledge, practice and satisfaction and self confidence of the 2nd degree nursing students.

**Research design:** A quasi experimental research design was utilized in the current study.

**Study Setting:** The study was carried out in the Faculty of Nursing at Tanta University.

## **SUBJECTS**

A purposive sample of 200 nursing students based on sample size calculation were selected and divided into two equal groups with 100 students in each one. **Students' inclusion criteria** were: 2<sup>nd</sup> degree nursing Students with both sex and having responsibility to participate in the study. The subjects were divided into two groups as follows:

**Study Group I:** It consists of 100 Students and they are exposed to a variety of critical care nursing scenarios that emphasized cardiovascular, respiratory and urinary assessment using traditional dolls.

**Study Group II:** It consists of 100 students and they are exposed to a variety of critical care nursing scenarios that emphasized cardiovascular, respiratory and urinary assessment using the Laerdal SimMan High Fidelity Simulator.

**Tools of the study:** Three tools were developed by the researchers after reviewing the relevant literature and used to collect the data.

**Tool I: Students' structured interview questionnaire.** This tool was developed by the researcher after reviewing the relevant literature. It consisted of two parts:

- **Part A: Students' socio-demographic data.** This tool was developed to assess data related to age, sex, previous degree in nursing field, working as a

healthcare provider and participation in human patient simulation.

- **Part B: Students' knowledge questionnaire** (16), to assess their knowledge regarding cardiovascular, respiratory and urinary systems. It consisted of 15 questions divided into three domains as follow:
  1. **Cardiovascular system domain:** It included questions related to correct position to palpate epical pulse, valve stenosis, nursing responsibility after invasive cardiovascular diagnosis and diagnostic tests to evaluate heart valve function (5 questions).
  2. **Respiratory system domain:** It included questions related to respiratory functions, abnormal respiratory sounds, and respiratory abnormalities (5 questions).
  3. **Urinary system domain:** It included questions related to common urinary tract abnormalities, and renal function tests (5 questions).

**Scoring system:** Each correct answer (for multiple choice questions) was scored one and the wrong answer was scored zero. The total scores of knowledge assessment questionnaire were 15. They were classified as: score less than 60 % were considered as unsatisfactory, score 60 % to less than 75 % were considered as satisfactory, and score more than 75 % were considered as good.

**Tool II: Student's performance observational checklist (17)**

This tool was developed by the researchers after reviewing the relevant literature and it was used to assess nursing students' performance related to cardiovascular, respiratory and urinary assessment. It included 87 steps divided into three domains:

1. **Cardiovascular assessment domain:** it included general inspection steps, cardiovascular inspection, auscultation, peripheral vascular palpation and steps related to assessment of chest pain (**38 items**).
2. **Respiratory assessment domain:** It included general inspection, chest inspection, palpation, chest percussion, and chest auscultation (**28 items**)
3. **Urinary assessment domain:** It included general assessment, inspection, percussion and palpation of the kidney and bladder assessment (**21 items**).

**Scoring system:** three scores were allotted for proficiently performed step, two scores for competently performed step, one score for incomplete performed step and need improvement, and zero score was given to incorrect or not done step.

The total scores of practice observational checklist were 261. The higher scores indicated higher level of practice. They were classified as: scores < 60 % were considered as poor, scores from 60 % to < 75% were considered as fair, and scores > 75% were considered as good practice level.

**Tool III: Students' satisfaction and self- confidence** (18): This tool was developed by the National League of Nursing (NLN) in 2005 using a 13-item instrument designed to measure student satisfaction (five items) with the simulation activity and self-confidence in learning (eight items) using a five-point scale. Likert scale for this tool was categorized as (1) strongly disagree to (5) strongly agree.

## METHODS

### *Ethical consideration:*

- An official permission to carry out the study was obtained from the Dean of the Faculty.
- Student's written consent to participate in the study was obtained.

**Tools validity and reliability:** The content validity of the developed knowledge questionnaire and observational checklist tools was done by revision of five panels of experts in Medical Surgical Nursing Department to ensure their validity. The reliability of the knowledge questionnaire was confirmed by using Crobach alpha test and it was 0.93. The reliability of the practice was confirmed by using Crobach alpha test and it was 0.90.

Reliability of tool III was tested using Cronbach's alpha as: satisfaction = 0.94; selfconfidence = 0.87.

**Pilot Study:** A pilot study was carried out on 10 nursing students to test the tools for clarity, applicability and feasibility and relevance of these tools. Modifications on tools were done and the 10 nurses were excluded from the study sample.

**Procedure:** The study was conducted through three phases (Preparatory, implementation and evaluation phases):

### *The preparatory phase:*

Each student was informed about the purpose, procedure, benefits, and nature of the study and that he/she had the right to withdraw from the study at any time without any rationale. Confidentiality of each student was obtained through coding of all data. Data collection for the study was conducted in the period from January 2016 until April 2016.

In this phase the researchers were concerned with constructing, testing and piloting different data collection tools. The program was developed based on the review of current literature. A log book containing the component of the program was written in simple English language; colored booked was devolved and supplemented by photos and illustrations to help the nursing students understanding of the content. The researchers selected teaching methods which were lectures, small group discussion, and problem solving situations by using traditional dolls for traditional group and Laerdal SimMan high fidelity simulator for simulation group.

### *The implementation phase:*

An educational program was carried out for all nursing students in educational classrooms at the Faculty of Nursing. The program consisted of six sessions: three sessions were conducted for three consecutive days for the theoretical part and three sessions were conducted for three consecutive days for practical part. The teaching program was conducted within small groups (15-20 students /session).

**For the theoretical part:** three sessions were used for three consecutive days. Each session had taken duration of one hour. **Session one** of the program consisted of explaining aim of the study, introduction about cardiovascular system, anatomy and physiology and function of cardiovascular system. **Session two** consisted of short notes about

respiratory system, anatomy and physiology and function of respiratory system. **Session three** consisted of introduction about urinary system, function, anatomy and physiology of urinary system. Each student was supplemented with the knowledge booklet and received printed materials. During the classes, students were encouraged to ask questions and provide feedback. Teaching methods utilized were lectures, group discussions, and demonstrations.

**For the practical part:** three sessions were used following the theoretical sessions for three consecutive days three hours for each. Students were divided into small groups (15-20 nurses) in each group. Selected procedures (cardiovascular assessment, respiratory assessment and urinary assessment) were taught by the researchers. **Session one** included cardiovascular assessment. **Session two** covered respiratory assessment. **Session three** consisted of urinary assessment. The practical part was carried out in the skill lab. Demonstration and re-demonstration was done for each student. The teaching media used in the study included real case study and problem solving situation.

**The evaluation phase:** All students in both groups were evaluated by using tool I, II and III after implementation of the teaching strategies in each group.

**For theoretical part,** each student was interviewed individually after the three sessions of education to answer the structured questionnaire (Tool I) and the time taken was one hour to fill in the questionnaire.

**Regarding practices,** each student was observed individually in both groups in the skill lab after the implementation of teaching strategies to evaluate the practices regarding cardiovascular, respiratory and urinary assessment through observational checklist. It took an average of 30-45 minutes for each procedure to complete.

**Satisfaction and self-confidence** were evaluated by using Tool III for both groups.

#### **Limitations of the study:**

The limitations of the study included the following:

1. Most of students had misconception that high fidelity simulation is better than low fidelity and it is useful for skills involving complex interactions requiring integration of cognitive and psychomotor skills coupled with interaction with others in healthcare settings.
2. Human Patient Simulation led to over-confidence in some students

**Statistical analysis:** The analysis was performed using statistical software SPSS version 23.

- For quantitative data, the range, mean and standard deviation were calculated.
- For qualitative data, a comparison between groups was done by using Chi-square test.

For a comparison among more than two means, the F-value of ANOVA was calculated.

A significance was adopted at  $P < 0.05$  for interpretation of results of tests of significance.

## **RESULTS**

**Table (1) shows the distribution of socio-demographic characteristics of the 2<sup>nd</sup> degree nursing students for both studied groups.** The results revealed that most percentages (88.0% and 77.0% respectively) of nursing students of both studied groups aged from 18 to 20, while the least percentages of students both groups (12.0% and 23.0%) respectively were more than 20 years old.

**In relation to sex,** it was found that more than half (52.0%) of nursing students of studied group I and about three quarters (78.0%) of the studied group II were females, while the remaining percentage (48.0% and 22.0% ) of group I and group II of were males respectively.

**As regard to students' role as a health care provider;** it was found that more than half (56.0% and 54.0%) of study group I and study group 2 had no previous work as a health care provider respectively. Approximately one quarter (20.0% and 25.0%) of both study group I and II respectively worked as nursing assistance compared to only 6.0% of group I and none of the study group II had certified nursing assistance and patient care teaching. On the other hand, only 8.0% and 4.0% of nursing students of study group I worked as a multi skilled assistant and unit secretary respectively compared to 11.0% and 10.0% the of study group II respectively.

**Regarding participation in human patient simulation;** vast majority (94.0% and 85.0%) of nursing students of both studied groups I and II respectively had not participated in human patient simulation, while only 0.6% and 15.0% of both groups respectively were participated.

Statistical significant differences were observed among both study groups in relation to age, sex, students as health care providers and participation in human patient simulation with  $P$ -value  $< 0.05$ .

**Table (2) shows a comparison of total and subtotal mean knowledge scores among the studied students.** The findings indicated that the mean score ( $3.68.00 \pm 3.584$ ) of cardiovascular assessment domain of study group I was higher than that of the study group II ( $3.65 \pm 0.730$ ). This difference was not statistically significant ( $P = 0.749$ ).

**Regarding the mean score of respiratory and urinary assessment:** It was noticed that the mean score ( $2.86 \pm 1.014$  and  $2.05 \pm 0.957$ ) of respiratory and urinary assessment domains of study group I respectively were lower than that of the study group II ( $3.79 \pm 1.028$  and  $2.75 \pm 1.077$ ) respectively and these difference were statistically significant ( $P = 0.00$ ).

**Table (3) represents percentage distribution of the studied 2<sup>nd</sup> degree nursing regarding domains of practice in relation to two different teaching strategies.** In this table, the majority (62.0%, 74.0% and 72.0%) of students who learned by traditional teaching strategy (group I) were in need for improvement in urinary, respiratory and cardiovascular assessment respectively, while the minority (26.0% and 18.0%) of the same group were competently

performed respiratory and urinary assessment domains respectively and only 8.0% of them had not done the correct steps of cardiovascular assessment.

On the other hand, approximately two thirds (65.0%, 65.0% and 66.0%) of the study group II were proficiently performed all the three assessment domains (urinary, respiratory and cardiovascular assessments) respectively and the differences were statistically significant with ( $P = 0.00$ ).

**Table (4) shows Percentage distribution of the studied 2nd degree nursing students with two different teaching strategies in relation to total knowledge and total practice score.** It can be seen that approximately half (52.0%) of the study group I had unsatisfactory knowledge score compared to 17.0% of the study group II. In addition, 47.0% of the study group I had satisfactory knowledge score compared to two third (61.0%) of the study group II.

**In relation to total practice score**, vast majority (97.0%) of the study group I had poor total practice score compared to only 9.0% of the study group II. Also none of the study group I had good total practice score compared to more than one third (38.0%) of the study group II.

Statistical significant differences were observed among the students of both study groups in relation to the total knowledge and total practice scores with  $P = 0.00$ .

**Table (5) shows percentage distribution of studied 2nd degree nursing students in relation to total satisfaction and self confidence scores.** The results revealed that more than two thirds (68.0%) of study group I had low satisfaction score compared to only 9.0% of studied group II. On the other hand, one fifth (20.0%) of studied group I had high level of satisfaction compared to more than half (58.0%) of studied group II.

Concerning the level of self-confidence, it can be also observed that more than half (61.0%) of the study group I had low self-confidence score compared to none of the study group II. Conversely more than one third (44.0%) of the study group II had high level of self confidence compared to only 4.0 % of study the group I.

There were statistically significant differences among students of both studied groups in relation to the total satisfaction and total self-confidence scores with  $P = 0.00$ .

**Table (6) shows a comparison between the total knowledge and practice scores among 2nd degree nursing students with two different teaching strategies.** It was found that about half (52.0%) of the study group I had an unsatisfactory knowledge score compared to only 17.0% of study group II. the majority (97.0%) of nursing students of study group I had poor practice score compared to only 9.0 % of study group II and 47.0% of study group I had satisfactory knowledge compared to two thirds (61.0%) of the study group II.

It can be seen that there were no statistical significant differences between the two studied groups in relation to

both of the total knowledge and practice scores ( $P=0.869$  and  $0.092$ , respectively).

**Table (7) reveals a comparison of the total practice score in relation to both of satisfaction and self -confidence levels among the 2nd degree nursing students with two different teaching strategies.** It was observed that the majority (68.0%) and vast majority (97.0%) the of nursing students of study group I had low satisfaction level and poor practice score respectively with no statistical differences between the level of satisfaction and the total practice score with  $P=0.483$ . On the other hand, about two thirds (58.0%) and more than one third (38.0%) of the study group II had a high level of satisfaction and good practice score respectively with no statistical difference where  $P=0.360$ . Also, in this table, no statistical significant differences were observed between the two study groups in relation to the total practice score and the level of self-confidence with  $P=0.931$  and  $0.103$ , respectively.

**Table (8) illustrates a comparison of total knowledge score and both of satisfaction and self-confidence levels among 2nd degree nursing students with different teaching strategies.** In this table statistical significant differences were observed among both study groups in relation to total knowledge score and level of satisfaction where  $P= 0.017$ ,  $0.002$ .

Moreover, statistical significant differences were found among both study groups in relation to the total knowledge score and the level of self - confidence where  $P=0.035$ ,  $0.012$ .

**Table (9): This table shows the effect of age on the total knowledge and total practice scores among all the study 2nd degree nursing students with two different teaching strategies.** It was observed that all the nursing students (100%) >20 years and the majority (96.6%) of students aged between 18-20 years in the study group I had poor practice score. No significant difference was observed in relation to age and the total practice score where  $P=0.516$ . In addition, more than half (58.4%) of nursing students >20 years and half (51%) of students aged between 18-20 had poor knowledge score in the study group I. A significant difference was observed between age and total knowledge score where  $P=0.018$

**Regarding study group II (simulation group)**, this result represents that only about one quarter (26.1%) of students aged more than 20 years and only 3.9% of the students aged between 18- 20 years had poor practice score. Also, two thirds (59.8%) and one third (30.4%) of students >20 years and aged between 18- 20 year had fair practice score respectively. In addition, about half (47.9%) of the students aged more than 20 years had poor knowledge score compared to only 6.0% of the students aged between 18- 20 years.

Statistical significant differences were observed among group II regarding the total practices and total knowledge scores where  $P= 0.002$  and  $0.00$  respectively.

**Table (10): this table shows the effect of students' participation in human patient simulation on the total practice and Total knowledge score among all the studied 2<sup>nd</sup> degree nursing students.** It was observed that the majority (96.8%) of student had not participated in human patient simulation in group I had poor practice score and half (50.0%) of them had poor knowledge score. Also, all of the nursing students (100%) and the majority (83.3%) of the same group who participated in human patient simulation had poor practice poor knowledge score. Also, no significant differences were observed in relation to total

practice and total knowledge score and participation in human patient simulation with P>0.05.

**Regarding simulation group (group II),** it was observed that about two thirds (60.0%) and more than one third (40.0%) of the students who participated in human patient simulation had fair and good practice scores respectively. In addition, more than half (53.3%) and 46.7% of student participated in human patient simulation had fair and good knowledge scores respectively. A statistical significant difference was observed with P=0.018.

**Table (1): Distribution of Socio-demographic characteristics of 2nd degree nursing students for both studied groups.**

| Socio-demographic characteristics        |                             | The studied nursing students (n=200) |      |                  |      | Total |      | $\chi^2$<br>P   |
|--|-----------------------------|--------------------------------------|------|------------------|------|-------|------|-----------------|
|  |                             | Group I (n=100)                      |      | Group II (n=100) |      |       |      |                 |
|  |                             | N                                    | %    | N                | %    | N     | %    |                 |
| Age                                      | 18-20 years                 | 88                                   | 88.0 | 77               | 77.0 | 165   | 82.5 | 4.19<br>0.04*   |
|  | > 20 years                  | 12                                   | 12.0 | 23               | 23.0 | 35    | 17.5 |                 |
| Sex                                      | Male                        | 48                                   | 48.0 | 22               | 22.0 | 70    | 35.0 | 14.86<br>0.00*  |
|  | Female                      | 52                                   | 52.0 | 78               | 78.0 | 130   | 65.0 |                 |
| student's role as a health care provider | no                          | 56                                   | 56.0 | 54               | 54.0 | 110   | 55.0 | 15.64<br>0.008* |
|  | Certified nursing assistant | 6                                    | 6.0  | 0                | 0.0  | 6     | 3.0  |                 |
|  | Nursing assistant           | 20                                   | 20.0 | 25               | 25.0 | 45    | 22.5 |                 |
|  | Patient care teaching       | 6                                    | 6.0  | 0                | 0.0  | 6     | 3.0  |                 |
|  | Multi-skilled assistant     | 8                                    | 8.0  | 11               | 11.0 | 19    | 9.5  |                 |
|  | Unit Secretary              | 4                                    | 4.0  | 10               | 10.0 | 14    | 7.0  |                 |
| participated in human patient simulation | no                          | 94                                   | 94.0 | 85               | 85.0 | 179   | 89.5 | 4.31<br>0.038*  |
|  | yes                         | 6                                    | 6.0  | 15               | 15.0 | 21    | 10.5 |                 |

*Group I: Traditional method. Group II: High fidelity Simulation method*

*\* Significant at level P<0.05.*

Table (2) Mean and standard deviation of 2<sup>nd</sup> degree nursing students for both studied groups regarding total and subtotal knowledge domains.

| Knowledge domains                      | The studied nursing students |                     | F             | P            |
|--|------------------------------|---------------------|---------------|--------------|
|  | Mean ± SD                    |                     |               |              |
|  | Group I<br>(n=100)           | Group II<br>(n=100) |               |              |
| 1. Domain of cardiovascular assessment | 3.68±0.584                   | 3.65±0.730          | 0.103         | 0.749        |
| 2. Domain of respiratory assessment    | 2.68±1.014                   | 3.79±1.028          | 59.112        | 0.00*        |
| 3. Domain of urinary assessment        | 2.05±0.957                   | 2.75±1.077          | 23.606        | 0.00*        |
| <b>Total mean score of knowledge</b>   | <b>8.41±1.349</b>            | <b>10.19±1.796</b>  | <b>62.787</b> | <b>0.00*</b> |

Group I: Traditional method. Group II: High Fidelity Simulation method

\* Significant at level P<0.05.

Table (3): Comparison among 2nd degree nursing students with two different teaching strategies regarding practice domains.

| Practice domains                    |                      | The studied nursing students<br>(n=200) |      |                      |      | F<br>P         |
|-------------------------------------|----------------------|---|------|----------------------|------|----------------|
|                                     |                      | Group I<br>(n =100)                     |      | Group II<br>(n =100) |      |                |
|                                     |                      | N                                       | %    | N                    | %    |                |
| 1. Urinary assessment domain        | Not done             | 0                                       | 0.0  | 0                    | 0.0  | 127.1<br>0.00* |
|                                     | Need improvement     | 62                                      | 62.0 | 0                    | 0.0  |                |
|                                     | competent performed  | 38                                      | 38.0 | 35                   | 35.0 |                |
|                                     | proficient performed | 0                                       | 0    | 65                   | 65.0 |                |
| 2. Respiratory assessment domain    | Not done             | 0                                       | 0.0  | 0                    | 0.0  | 134.2<br>0.00* |
|                                     | Need improvement     | 74                                      | 74.0 | 2                    | 2.0  |                |
|                                     | competent performed  | 26                                      | 26.0 | 33                   | 33.0 |                |
|                                     | proficient performed | 0                                       | 0    | 65                   | 65.0 |                |
| 3. Cardiovascular assessment domain | Not done             | 8                                       | 8.0  | 2                    | 2.0  | 139.7<br>0.00* |
|                                     | Need improvement     | 72                                      | 72.0 | 0                    | 0.0  |                |
|                                     | competent performed  | 18                                      | 18.0 | 32                   | 32.0 |                |
|                                     | proficient performed | 2                                       | 2.0  | 66                   | 66.0 |                |

Group I: Traditional method. Group II: High Fidelity Simulation method

\* Significant at level P<0.05.

Table (4): Percentage distribution of studied 2nd degree nursing students with two different teaching strategies in relation to total knowledge and total practice score.

| Total scores          |                | The studied nursing students<br>(n=200) |      |                     |      | $\chi^2$ | P     |
|-----------------------|----------------|---|------|---------------------|------|----------|-------|
|                       |                | Group I<br>(n=100)                      |      | Group II<br>(n=100) |      |          |       |
|                       |                | N                                       | %    | N                   | %    |          |       |
| Total knowledge score | unsatisfactory | 52                                      | 52.0 | 17                  | 17.0 | 38.74    | 0.00* |
|                       | satisfactory   | 47                                      | 47.0 | 61                  | 61.0 |          |       |
|                       | good"          | 1                                       | 1.0  | 22                  | 22.0 |          |       |
| Total Practice score  | poor           | 97                                      | 97.0 | 9                   | 9.0  | 153.70   | 0.00* |
|                       | fair           | 3                                       | 3.0  | 53                  | 53.0 |          |       |
|                       | good           | 0                                       | 0.0  | 38                  | 38.0 |          |       |

Group I: Traditional method. Group II: High Fidelity Simulation method

\* Significant at level P<0.05.

Table (5): Percentage distribution of studied 2nd degree nursing students with two different teaching strategies regarding total satisfaction and total self confidence score.

| Total scores                |                          | The studied nursing students |      |                     |      | $\chi^2$ | P     |
|-----------------------------|--------------------------|------------------------------|------|---------------------|------|----------|-------|
|                             |                          | Group I<br>(n=100)           |      | Group II<br>(n=100) |      |          |       |
|                             |                          | N                            | %    | N                   | %    |          |       |
| Total satisfaction score    | Low satisfaction         | 68                           | 68.0 | 9                   | 9.0  | 73.52    | 0.00* |
|                             | Moderate satisfaction    | 12                           | 12.0 | 33                  | 33.0 |          |       |
|                             | High satisfaction        | 20                           | 20.0 | 58                  | 58.0 |          |       |
| Total self confidence score | Low self confidence      | 61                           | 61.0 | 0                   | 0.0  | 99.17    | 0.00* |
|                             | moderate self confidence | 35                           | 35.0 | 56                  | 56.0 |          |       |
|                             | high self confidence     | 4                            | 4.0  | 44                  | 44.0 |          |       |

Group I: Traditional method. Group II: High Fidelity Simulation method

\* Significant at level P<0.05.



Table (6): Comparison between total knowledge and practice scores for 2nd degree nursing students with two different teaching strategies.

| Total Knowledge score | Total practice score |             |                |                |                      |              |              |                |                |
|-----------------------|----------------------|-------------|----------------|----------------|----------------------|--------------|--------------|----------------|----------------|
|                       | Group I<br>(n =100)  |             |                |                | Group II<br>(n =100) |              |              |                |                |
|                       | Poor<br>n=97         | Fair<br>n=3 | Total<br>n=100 | $\chi^2$<br>P  | Poor<br>n=9          | Fair<br>n=53 | Good<br>n=38 | Total<br>n=100 | $\chi^2$<br>P  |
|                       | N<br>%               | N<br>%      | N<br>%         |                | N<br>%               | N<br>%       | N<br>%       | N<br>%         |                |
| Unsatisfactory        | 50<br>50.0           | 2<br>2.0    | 52<br>52.0     | 0.282<br>0.869 | 2<br>2.0             | 4<br>4.0     | 11<br>11.0   | 17<br>17.0     | 7.993<br>0.092 |
| Satisfactory          | 46<br>46.0           | 1<br>1.0    | 47<br>47.0     |                | 6<br>6.0             | 36<br>36.0   | 19<br>19.0   | 61<br>61.0     |                |
| Good                  | 1<br>1.0             | 0<br>0.0    | 1<br>1.0       |                | 1<br>1.0             | 13<br>13.0   | 8<br>8.0     | 22<br>22.0     |                |

Group I: Traditional method. Group II: High Fidelity Simulation method

Table (7): Comparison of total practice score in relation to both of satisfaction and self-confidence levels among 2nd degree nursing students with two different teaching strategies.

| Levels                   |          | Total practice score |          |          |              |                     |            |            |              |
|--------------------------|----------|----------------------|----------|----------|--------------|---------------------|------------|------------|--------------|
|                          |          | Group I<br>(n=100)   |          |          |              | Group II<br>(n=100) |            |            |              |
|                          |          | poor                 | fair     | Good     | Total        | poor                | fair       | good       | Total        |
|                          |          | N<br>%               | N<br>%   | N<br>%   | N<br>%       | N<br>%              | N<br>%     | N<br>%     | N<br>%       |
| Level of satisfaction    | low      | 65<br>65.0           | 3<br>3.0 | 0<br>0.0 | 68<br>68.0   | 1<br>1.0            | 2<br>2.0   | 5<br>5.0   | 9<br>9.0     |
|                          | moderate | 12<br>12.0           | 0<br>0.0 | 0<br>0.0 | 12<br>12.0   | 4<br>4.0            | 19<br>19.0 | 9<br>9.0   | 33<br>33.0   |
|                          | high     | 20<br>20.0           | 0<br>0.0 | 0<br>0.0 | 20<br>20.0   | 4<br>4.0            | 32<br>32.0 | 22<br>22.0 | 58<br>58.0   |
| Total                    |          | 97<br>97.0           | 3<br>3.0 | 0<br>0.0 | 100<br>100.0 | 9<br>9.0            | 53<br>53.0 | 38<br>38.0 | 100<br>100.0 |
| $\chi^2, P$              |          | 1.455, 0.483         |          |          |              | 4.353, 0.360        |            |            |              |
| Level Of Self confidence | low      | 59<br>59.0           | 2<br>2.0 | 0<br>0.0 | 61<br>61.0   | 0<br>0.0            | 0<br>0.0   | 0<br>0.0   | 0<br>0.0     |
|                          | moderate | 34<br>34.0           | 1<br>1.0 | 0<br>0.0 | 35<br>35.0   | 8<br>8.0            | 29<br>29.0 | 19<br>19.0 | 56<br>56.0   |
|                          | high     | 4<br>4.0             | 0<br>0.0 | 0<br>0.0 | 4<br>4.0     | 1<br>1.0            | 24<br>24.0 | 19<br>19.0 | 44<br>44.0   |
| Total                    |          | 97<br>97.0           | 3<br>3.0 | 0<br>0.0 | 100<br>100.0 | 17<br>17.0          | 61<br>61.0 | 22<br>22.0 | 100<br>100.0 |
| $\chi^2, P$              |          | 0.142, 0.931         |          |          |              | 4.542, 0.103        |            |            |              |

Group I: Traditional method. Group II: High Fidelity Simulation method

\* Significant at level P<0.05.

Table (8): Comparison of total knowledge score in relation to both of satisfaction and self-confidence levels among 2nd degree nursing students with two different teaching strategies.

| Levels                       |                                | Total knowledge score |            |          |              |                     |            |            |              |
|------------------------------|--------------------------------|-----------------------|------------|----------|--------------|---------------------|------------|------------|--------------|
|                              |                                | Group I<br>(n=100)    |            |          |              | Group II<br>(n=100) |            |            |              |
|                              |                                | poor                  | fair       | good     | Total        | poor                | fair       | good       | Total        |
|                              |                                | N<br>%                | N<br>%     | N<br>%   | N<br>%       | N<br>%              | N<br>%     | N<br>%     | N<br>%       |
| Levels<br>Of<br>satisfaction | low                            | 35<br>35.0            | 32<br>32.0 | 1<br>1.0 | 68<br>68.0   | 6<br>6.0            | 2<br>2.0   | 1<br>1.0   | 9<br>9.0     |
|                              | moderate                       | 11<br>11.0            | 1<br>1.0   | 0<br>0.0 | 12<br>12.0   | 4<br>4.0            | 21<br>21.0 | 8<br>8.0   | 33<br>33.0   |
|                              | high                           | 6<br>6.0              | 14<br>14.0 | 0<br>0.0 | 20<br>20.0   | 7<br>7.0            | 38<br>38.0 | 13<br>13.0 | 58<br>58.0   |
| Total                        |                                | 52<br>52.0            | 47<br>47.0 | 1<br>1.0 | 100<br>100.0 | 17<br>17.0          | 61<br>61.0 | 22<br>22.0 | 100<br>100.0 |
| $\chi^2, P$                  |                                | 12.035, 0.017*        |            |          |              | 17.36, 0.002*       |            |            |              |
| Self<br>confidence           | low self<br>confidence         | 25<br>25.0            | 36<br>36.0 | 0<br>0.0 | 61<br>61.0   | 0<br>0.0            | 0<br>0.0   | 0<br>0.0   | 0<br>0.0     |
|                              | moderate<br>self<br>confidence | 24<br>24.0            | 10<br>10.0 | 1<br>1.0 | 35<br>35.0   | 15<br>15.0          | 31<br>31.0 | 10<br>10.0 | 56<br>56.0   |
|                              | high self<br>confidence        | 3<br>3.0              | 1<br>1.0   | 0<br>0.0 | 4<br>4.0     | 2<br>2.0            | 30<br>30.0 | 12<br>12.0 | 44<br>44.0   |
| Total                        |                                | 52<br>52.0            | 47<br>47.0 | 1<br>1.0 | 100<br>100.0 | 17<br>17.0          | 61<br>61.0 | 22<br>22.0 | 100<br>100.0 |
| $\chi^2, P$                  |                                | 10.351, 0.035*        |            |          |              | 8.826, 0.012*       |            |            |              |

Group I: Traditional method. Group II: High Fidelity Simulation method

\* Significant at level P<0.05.

Table (9): The effect of age on total knowledge and total practice scores among all studied 2nd degree nursing students with two different teaching strategies.

| Total scores                |                 | Age                |               |               |                     |                 |                  |
|-----------------------------|-----------------|--------------------|---------------|---------------|---------------------|-----------------|------------------|
|                             |                 | Group I<br>(n=100) |               |               | Group II<br>(n=100) |                 |                  |
|                             |                 | 18-20<br>(n=88)    | >20<br>(n=12) | $\chi^2$<br>P | 18-20<br>(n=77)     | >20<br>(n=23)   | $\chi^2$<br>P    |
|                             |                 | N<br>%             | N<br>%        |               | N<br>%              | N<br>%          |                  |
| Total<br>practice<br>score  | <157<br>Poor    | 85<br>96.6         | 12<br>100.0   | 3<br>3.9      | 6<br>26.1           | 0.422<br>0.516  | 12.796<br>0.002* |
|                             | 158-193<br>Fair | 3<br>3.4           | 0<br>0.0      | 46<br>59.8    | 7<br>30.4           |                 |                  |
|                             | 194-261<br>Good | 0<br>0.0           | 0<br>0.0      | 28<br>36.3    | 10<br>43.5          |                 |                  |
| Total<br>knowledge<br>score | <9<br>Poor      | 45<br>51.1         | 7<br>58.4     | 6<br>6.0      | 11<br>47.9          | 7.098<br>0.018* | 12.272<br>0.00*  |
|                             | 9-11<br>Fair    | 43<br>48.9         | 4<br>33.3     | 54<br>54.0    | 7<br>30.4           |                 |                  |
|                             | 12-15<br>Good   | 0<br>0.0           | 1<br>8.3      | 17<br>17.0    | 5<br>21.7           |                 |                  |

Group I: Traditional method. Group II: High Fidelity Simulation method

\* Significant at level P<0.05.

**Table (10): The effect of students' participation in human patient simulation on both total practice and knowledge scores among all studied 2<sup>nd</sup> degree nursing students with two different teaching strategies.**

| Total scores                |                   | Students' participation       |                       |                               |                        |
|-----------------------------|-------------------|-------------------------------|-----------------------|-------------------------------|------------------------|
|                             |                   | Group I<br>(n=100)            |                       | Group II<br>(n=100)           |                        |
|                             |                   | Not<br>Participate<br>(n =94) | participate<br>(n =6) | Not<br>Participate<br>(n =85) | participate<br>(n =15) |
|                             |                   | N<br>%                        | N<br>%                | N<br>%                        | N<br>%                 |
| Total<br>practice<br>score  | <157<br>"poor"    | 91<br>96.8                    | 6<br>100.0            | 9<br>10.6                     | 0<br>0                 |
|                             | 158-193<br>"fair" | 3<br>3.2                      | 0<br>0.0              | 44<br>51.8                    | 9<br>60.0              |
|                             | 194-261<br>"good" | 0<br>0.0                      | 0<br>0.0              | 32<br>37.6                    | 6<br>40                |
| $\chi^2$ , P                | 0.197, 0.657      |                               |                       | 1.770, 0.413                  |                        |
| Total<br>knowledge<br>score | <9<br>"poor"      | 47<br>50.0                    | 5<br>83.3             | 17<br>20.0                    | 0<br>0.0               |
|                             | 9-11<br>"fair"    | 46<br>48.9                    | 1<br>16.7             | 53<br>62.4                    | 8<br>53.3              |
|                             | 12-15<br>"good"   | 1<br>1.0                      | 0<br>0.0              | 15<br>17.6                    | 7<br>46.7              |
| $\chi^2$ , P                | 2.519, 0.284      |                               |                       | 8.051, 0.018*                 |                        |

Group I: Traditional method. Group II: High Fidelity Simulation method

\* Significant at level P<0.05.

## DISCUSSION

Preparation of novice critical care nursing students to engage in critical decisions is important to health care administrators, practicing nurses, physicians, nursing faculty, nursing students, and the community as a whole. The reasons of a greater emphasis have been placed on the preparation of nursing students is because acuity levels of patients has increased over the years. Moreover to improve competency, members of nursing faculty have integrated the use of human patient simulation (HPS) into nursing curriculum (14, 19).

Regarding Sociodemographic characteristics, the present study revealed that the most common age group among 2nd degree nursing students of both study groups was between 18 and 20 years. This result was in congruent with *Hall 2013* (8), who stated that the majority of studied student' ages were between 18-21 years.

**In relation to sex:** The current study showed that more than half of nursing students of study group I and three quarters of study group II were females. This result was inconsistent with *National Council of State Boards of Nursing 2009*, (6) who found that the majority of students were men.

**As regards previous experience as a health care provider,** The present study stated that more than half of nursing students of both study groups had not any previous experience as a health care provider. This may be interpreted that most of undergraduate nursing students

emphasize their academic studies rather than working in the hospital.

The finding of this study was in line with *National Council of State Boards of Nursing (2009)*(6) and *Hall 2013*, (8), they mentioned that approximately one-third of the nursing students had some experience in health care, such as working as a nursing assistant or technician in a lab.

The current study showed that there were significant correlations regarding knowledge domains of respiratory and urinary assessment among nursing students of both studied group I and II. This may be related to the correlation between learning approaches and transfer of learning to the workplace. This finding was in line with *Howard 2007* (20), *Brannan et al and Linden 2008* (21, 22), *Cooper et al 2010*, (23), *Piscotty et al (2011)*(24), *Shinnick et al* (25), *Liaw et al* (26) and *Yuan et al. (2012)* (27), they concluded that there is a significant difference in knowledge gains noted with undergraduate nursing students after participation in a simulation exercise. Also, *Kirkman 2011* (14), clarified that the mean difference was greater following HPS clinical than following the respiratory assessment lecture. These results indicate that students were able to transfer knowledge and skills from HPS clinical to the traditional clinical setting.

**Regarding to practice,** the present study revealed significant positive correlations between respiratory, urinary and cardiovascular assessment domains among nursing students of both studied groups .This can be attributed to

high-fidelity simulators produced realistic simulated-patient experience and helped the nursing students to become familiar with patient care. This result was supported by **Square 2012** (28), who stated that the majority of the participants believed that simulation activity was a valuable way to practice events encountered during patient care.

Concerning satisfaction and self-confidence, the present study found that there were statistically significant differences among students of both studied groups in relation to total satisfaction and self-confidence scores. This occurred due to simulation allowed students with the opportunity to practice respiratory, urinary and cardiovascular assessment domains and receive immediate feedback from the simulator in response to student's action. This result was consistent with **Garrett et al 2011** (29), who showed that measuring self-confidence and self-efficacy gains when using high-fidelity human simulation. On the other hand, this finding was contradicted by **Parker et al. 2011** (30), who found that there were no significant gains in confidence after the simulation experience.

The current study reported that half of nursing students in study group I had unsatisfactory knowledge and poor practice scores compared to study group II. This result was in line with **Decker et al 2008** (31) and **Underberg 2003**(32), they stated that simulations provided an alternative approach to learning that allowed nursing students to integrate theory and practice.

**In relation to total practice score and level of satisfaction and self-confidence:** It was obvious from results of the present study that nearly two thirds of nursing students of study group I had low satisfaction and poor practice score. It may result from frequent use of simulation promote confidence, success, and safety in performance of respiratory, urinary and cardiovascular assessment domains. This result was constant with **Bambini et al 2009** (33) and **Weheida et al** (34), they suggested that simulated clinical experiences increased self-efficacy, satisfaction, and self-confidence of students more than other traditional methods.

**Regarding total knowledge score level and satisfaction and self confidence,** a significant and statistical improvement was observed among simulation group (group II). The findings of this result were in line with **Hall 2013** (8), who stated that students' confidence levels increased after exposure to simulation with a small increase in knowledge gains that did not reach the level of statistical significance. Therefore, despite the self-reported increase in confidence, there were only small gains in cognition after the simulation experience. Also, **the Student Satisfaction and Self-Confidence in Learning Scale (NLN, 2005)**(18), clarified that the majority of the students strongly agreed that the simulation covered critical content necessary for the mastery of medical surgical curriculum and that they were able to obtain the required knowledge from the simulation to perform necessary tasks in a clinical setting. This indicates that the students felt very confident with the hands-on learning activity and felt that they were learning the required knowledge.

## CONCLUSION AND RECOMMENDATIONS

### CONCLUSION:

Based on the findings of the present study, it can be concluded that Simulation has been demonstrated to improve students' critical thinking and clinical reasoning in complex care situations and to aid the development of students' self-confidence in their own clinical abilities. Also, research findings indicating that the introduction of simulation technology (e.g. high-fidelity medical mannequins) supports positive outcomes for undergraduate nursing students. In addition it is associated with significantly improved interpersonal communication skills, enables the effective development of transferable, transformational leadership skills and associated with improved students' performance in crisis situations.

### RECOMMENDATIONS

- Future studies investigate the effect of using innovative clinical simulator on the patient's satisfaction toward health care provided by nursing students.
- There should be a continuous educational/ training program for nursing educators for updating the knowledge and skills regarding the use of innovative clinical teaching strategies.

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