The Effect of Clinical Simulation on the Cognitive Learning Abilities of Undergraduates of Silliman University College of Nursing

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This paper will describe the effect of clinical simulation using high-fidelity patient simulator on the cognitive learning abilities of undergraduates of Silliman University College of Nursing based on their performance in written tests. The test scores in the pretest were compared with the result in the test scores after the conduct of simulation in the experimental group. The results derived from the experimental group were compared with the test results of the control group that did not undergo simulation. The test scores indicated that clinical simulation was irrelevant as an additional learning strategy to enhance their knowledge base. The clinical simulation with the use of high-fidelity patient simulator did not enhance the cognitive knowledge these students (N = 31) already possessed especially when their knowledge base was already concreted by other methods. Mastery level of the concept and subject matter harnessed by other methods was more effective than applying the same to a near or close to real scenario using a high-fidelity simulator.

Keywords: clinical simulation, cognitive learning abilities, high-fidelity patient simulator, nursing education

INTRODUCTION

The potential risks to patients associated with learning at the *bedside* such as the administration of parenteral injection on a classmate/partner are becoming increasingly unacceptable because of ethical concerns. The search for innovative education and training methods that do not expose the patient to preventable errors continues. All the evidence shows that a significant proportion of adverse events in health care is caused by problems relating to the application of the *non-technical* skills of communication, teamwork, leadership, and decision-making. The increasing use of technology in health care and higher public and patient expectations have both encouraged the development and use of innovative educational methods in healthcare education (Lewis, Strachan, & Smith, 2012).

In this decade, technologies that were not available when the present-day educators went to nursing schools are widespread; an integration of the same is already apparent in most nursing colleges and schools in the Philippines. The Silliman University College of Nursing (SUCN) for one has adapted to the challenge of using high-fidelity patient simulators in the curriculum. Miller and Bull (2013) stated that "simulation based education (SBE) in health care is gaining popularity and provides an opportunity for students to acquire and practice clinical skills in a safe and controlled environment" (p. 241) This is not however a guarantee that learning is sure to take place especially on the cognitive level. Glidewell and Conley (2014) expressed that "although there are numerous studies that examine the relationship between simulation and student success, most focus on the affective and psychomotor domains of learning" (p. 23). This gives us the message that, while there is growing evidence of the value of simulation to learners, there is little understanding of the factors that influence academics or cognitive ability. It is further shown that other domains of learning must be inspected in terms of appreciating the success of the use of patient simulation. There is then a research gap in the cognitive aspect, as an equally important domain of learning. The researchers identified the relationship between the use of high-fidelity patient simulators and the academic test scores of students. This will secure evidence on the area of cognitive ability as an important learning outcome and the move to utilize high-fidelity patient simulator of specific scenarios in the teaching–learning activities of the students. Specifically, the following questions were answered:

1. What is the demographic profile of level III students of Silliman University College of Nursing in terms of the following variables?
   a. Age
   b. Gender
   c. Professional subject grade point average (PsGPA)
2. Is there a significant difference between the pretest and posttest scores

in the control group?

3. Is there a significant difference between the pretest and posttest scores in the experimental group?
4. Is there a significant difference between the mean scores of the pretest and posttest between the two groups?
5. Is there a significant relationship between the students' cognitive ability and their exposure to clinical simulation?

HYPOTHESES

It is generally hypothesized that clinical simulation has no significant effect on the improved cognitive learning abilities of students. Specifically, the following hypotheses were tested:

1. There is no significant difference between the scores in the pretest and posttest of the control group.
2. There is no significant difference between the scores in the pretest and posttest of the experimental group.
3. There is no significant difference between the mean scores of the pretest and posttest between the two groups.
4. There is no significant relationship between the students' cognitive ability and their exposure to clinical simulation.

The participants of this study were 31 level III students of SUCN. The students were exposed to the concepts of specific pathological alterations in their Nursing Care Management 104 (NCM 104) course and, for this study specifically, the concepts of perception and coordination. The researchers used a 20-item critical thinking questions test made by an expert (Master of Arts in Nursing, Major in Adult Nursing) on the topic of pregnancy-induced hypertension (PIH) preeclampsia with perception and coordination to measure the cognitive abilities of the students based on assessment utilizing the nursing process. The learners cared for a 35-year-old female who was then 36 weeks pregnant with her first child. She had been experiencing symptoms of preeclampsia for the past two weeks and had been managed on an outpatient basis; however, because of increasing edema and blood pressure, she had been hospitalized. She was treated with magnesium sulfate and hydralazine, but her condition did not improve. This simulated clinical experience (SCE) consisted of three states that were transitioned manually at the facilitator's discretion, with the exception of state 2 after magnesium sulfate, which transitioned automatically to state 3 after hydralazine was administered. The SCE ended with the patient's labor being induced. With manual transitions, the facilitator advanced to the applicable state when appropriate interventions were performed. This SCE prepared the learner for the following:

1. Safe and effective care environment
   a. Management of care
   b. Safety and infection control
2. Health promotion and maintenance
3. Psychosocial integrity
4. Physiological integrity
   a. Basic care and comfort
   b. Pharmacological and parenteral therapies
   c. Reduction of potential risks
   d. Physiological adaptations

A case scenario was adapted from the Program for Nursing Curriculum Integration (Ravert, 2002). The virtual laboratory coordinator, whose expertise exposed him to several intensive trainings on facilitation of clinical simulation and case scenario-making under Dr. Sharon Decker, Professor and the Director of Clinical Simulations at Texas Tech University Health Sciences Center in Lubbock, Texas, was in charge of facilitating students' learning through simulation. He was also trained by CAE Healthcare Company, the manufacturer of the high-fidelity patient simulator.

THEORETICAL CONSIDERATIONS

Seropian (2012), as cited in Secomb, McKenna, and Smith (2012), defined simulation as "the imitation of real life practice" (2003, p. 1698). There is the creation of a situation similar to a real scenario with either the use of high-fidelity patient simulator or human patient simulators who are trained. Hovancsek (2007), as cited in Cant and Cooper (2010), describes that the aim of simulation is "to replicate some or nearly all of the essential aspects of a clinical situation so that the situation may be more readily understood and managed when it occurs for real in clinical practice" (p. 145). Cant and Cooper (2010) had the occasion to define simulation using standardized patients as a method that "uses case studies and role playing in the simulated learning experience; individuals, students or paid actors are taught to portray a patient in a realistic and consistent manner" (p. 3). With this teaching technique, the learners are not threatened by the risk they are confronting in the real situation. And because of the processing of their learning experiences after each exposure, there is a wide acceptance of this method. Simulation, in fact, has been endorsed by nursing professional bodies (National Council of State Boards of Nursing, 2005).

Secomb, McKenna, and Smith (2012 as cited in Ravert, 2002; Billings & Halstead, 2012; Cioffi, Purcal, & Arundell, 2005), however, discussed how literatures are so assuming in their claim that computer-based simulation activities form a self-instruction method that can increase cognitive abilities. They further mentioned that no study that specifically looked into this area or has explicitly tested this assumption has provided evidence for practice. In the current systematic reviews conducted by Lapkin, Levett-Jones, Bellchamber, and Fernandez (2010) and Cant and Cooper (2010), it was acknowledged that there is a need for evidence on the effectiveness of using simulation mannequins in the teaching of clinical decision-making skills to undergraduate nursing students. They were specific in their report that the lack of evidence must call for more studies that would measure the effectiveness of simulation as an educational strategy. The objective of the study was to be able to ensure and support the claim that simulation would improve the knowledge and skills of undergraduate nursing students (Lapkin, Levett-Jones, Bellchamber, & Fernandez, 2010; Cant & Cooper, 2010). This is a rather sad fact of what is assumed to be a full-proof learning strategy.

It is also encouraging to note that there are also evidences that will positively support the use of clinical simulation in knowledge acquisition. Ravert (2002) in his study of researches showed that "the review indicates that 75% of the studies showed positive effects of simulation on skill and/or knowledge acquisition" (p. 203). In the systematic review of Cant and Cooper (2010), it was found that all 12 study reviews have reported statistical improvements in knowledge/skill, critical thinking ability, and/or confidence after the simulation education, indicating that simulation is an effective method of teaching and learning. It was also found in the abovementioned review that, out of nine studies assessing the effect of simulation on knowledge, four showed statistically significantly higher means for the experimental group compared with those for the control group.

Good (2003) discussed that "patient simulators are increasingly used in the education and training of physicians, nurses, emergency care personnel, and many other health care professionals" (p. 21). This is a statement that will show the effective acquisition of not only basic skills among undergraduate students but also advanced clinical skills using patient simulation. The need then to fill the gap as to the area of cognitive learning is a challenge and needs an urgent attention.

The social cognitive theory of John Dewey formed the structure of this study. Dewey believed that students thrive in an environment where they are allowed to experience and interact with the curriculum, and all students should have the opportunity to take part in their own learning. In addition to his ideas regarding what education is and what effect it should have on society, Dewey also had specific notions regarding how education should take place within the classroom. In The Child and the Curriculum (1902), Dewey discusses two major conflicting schools of thought regarding educational pedagogy. The first is centered on the curriculum and focuses almost solely on the subject matter to be taught. Dewey argues that the major flaw in this methodology is the inactivity of the student; within this particular framework, "the child is simply the immature being who is to be matured; he is the superficial being who is to be deepened" (1902, p. 13). He argues that, in order for education to be most effective, content must be presented in a way that allows the student to relate the information to prior experiences, thus deepening the connection with this new knowledge. Dewey had always stressed the importance of recognizing the significance and integrity of all aspects of human experience (http://www.iep.utm.edu/dewey/). This is an inspiring theory for the use of clinical simulation considering that experiences become part of the learning of the students. Students will most likely remember actual occurrences especially when they are actively involved in the process. With this theoretical framework as the backbone of this study, the measure of cognitive learning will be quantified in the scores of the test administered.

METHODS

This quasi-experimental study evaluated the effect of clinical simulation on the cognitive learning abilities of the level III students as measured by their academic test scores. The researchers used a 20-item critical thinking question test made by an expert on the topic of pregnancy-induced hypertension (PIH) preeclampsia with perception and coordination to measure the cognitive abilities of the students based on assessment utilizing the nursing process. The test scores in the pretest were compared with the result in the test scores after the conduct of simulation in the experimental group and then compared with the test result of the control group that did not undergo simulation. To determine if a significant difference exists between pre- and posttest scores in the control group or in the experimental group, the t test for paired observations was utilized at 0.05 level of significance. The test was employed on the assumption that the sample differences come from the population of such differences that are approximately normally distributed. In the test for significance of the difference between means of related samples, the nonparametric statistical tool Wilcoxon signed-rank test was utilized.

As regards the test for significance of the difference between control and experimental groups' performance, the t test for independent samples was employed at 0.05 level of significance; it was based on the assumption that the two samples come from normally distributed population.

To verify whether a significant relationship or association exists between two variables dealing with categorical data, chi-square test of independence at 0.05 level of significance was employed.

The cognitive learning abilities of the students were appreciated in quantifiable terms as an evidence that active learning is taking place. The conduct of the clinical simulation was perceived to improve their scores on the 20-item test that was administered before the simulation. The strength of the assumption that clinical simulation can significantly affect the cognitive learning ability of the learners was tested. Simulation entails the active integration of knowledge acquired through other strategies like self-study and/or socialized discussion. In the theory of John Dewey, the importance of how one recognizes the significance of an experience will spell the difference in the learning process; thus, the active involvement of the person is valuable. The significant improvement of the students' test scores prior to the simulation compared with those after the clinical experience will be tested to affirm the theory. The researchers tested this theory using the conceptual model illustrated in Fig. 1.

The study was conducted at the Mary Marquis Smith Hall, room 303, at the Silliman University College of Nursing (SUCN), Silliman University. Silliman University is a nonstock, and nonprofit educational institution guided by the vision of being a leading Christian institution committed to total human development for the well-being of society and environment. The SUCN is a center of excellence in nursing education granted by the Commission on Higher Education (CHED).

The participants of this study were 31 level III students of SUCN. The students were exposed to the concepts on pathological alterations in their NCM 104 course and, for this study, specifically on the concept on alterations in perception and coordination. The test scores obtained in this study were not included in the marks for grading. These students did not undergo simulation as part of their usual teaching–learning activities. They only went through a lecture-discussion on the specific concept. In this study, an additional methodology of a review of the previously discussed concept (a 1.5-hour lecture) for both experimental and control groups and simulation using high-fidelity patient simulator for the experimental group were introduced as part of their learning activities.

The researchers used a 20-item testing tool that covers the subject matter on the concept on perception and coordination. The researchers ranked the students based on their PsGPA in the past semester and grouped all first and second elements to the control and experimental groups, respectively, to ensure homogeneity in the composition between groups. The participants in this study have the following characteristics:

1. Enrolled in NCM 104;
2. Willing to participate in the study;
3. Must understand either Cebuano, Visayan, or English instructions; and
4. Must be 18 years old and above

This study was guided by the universally accepted ethical principles in conducting researches. No amount of harm was inflicted upon the participants nor were they forced or coerced to participate in the study. Their written informed consent as participants was secured, and all their rights pertinent thereto were observed throughout the conduct of the study. The study was submitted for review in the University's Ethics Board. All recommendations were integrated into the actual conduct of the study including the security of academic performances of the participants. All information gathered in this study was treated with utmost confidentiality.

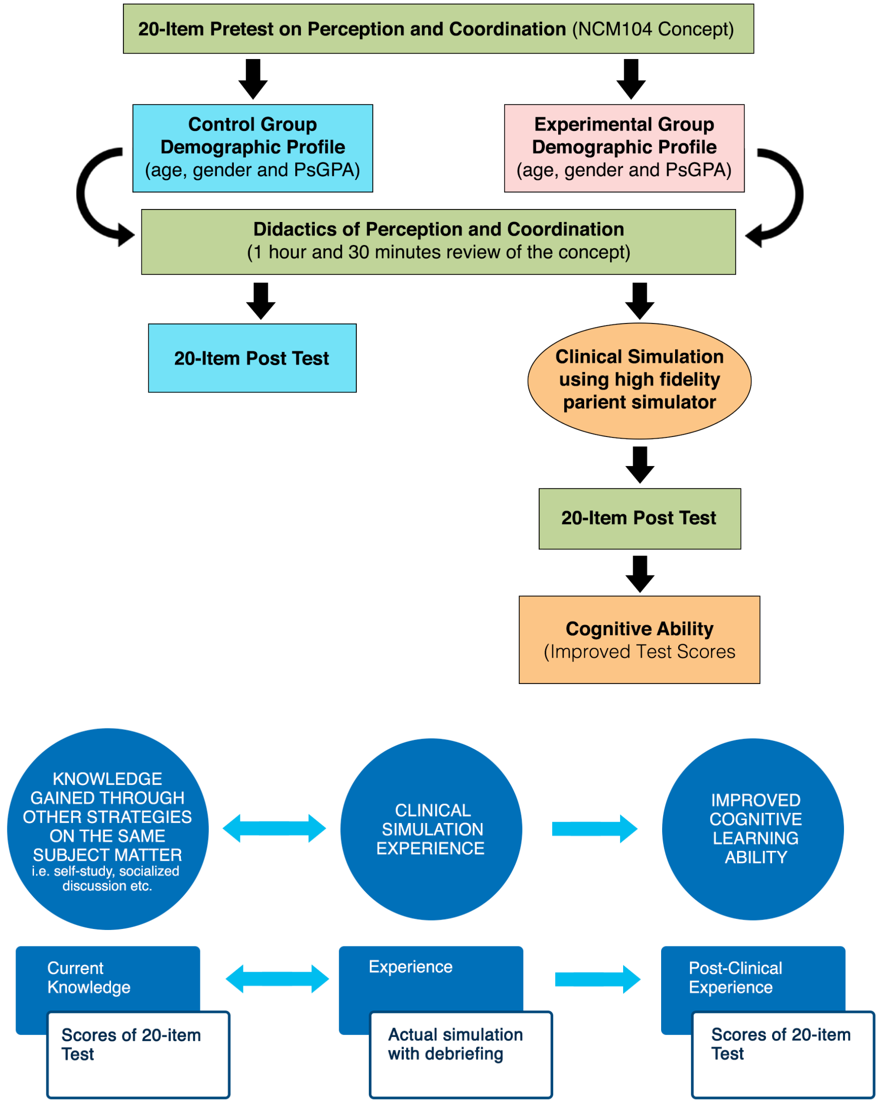

Figure 1. Conceptual Model

As shown in Fig. 1, the current knowledge gained from the learning strategies outside of the clinical simulation was the basis of observation. This is made quantifiable by the scores the students obtained in the 20-item pretest. The students under the experimental group were then exposed to a clinical simulation experience. In the experience, the students were expected to integrate their current knowledge to a scenario that mimics real-life situation. They were considered actively involved in the learning process, and based on the theory of

John Dewey, in order for learning to be most effective, content must be presented in a way that allows the students to relate the information to experiences, thus deepening the connection with this new knowledge. This was hypothesized to lead to a new knowledge that is posited to have improved their cognitive learning abilities as reflected in an improved score in the posttest compared to those who were not exposed to clinical simulation.

RESULTS AND DISCUSSION

The age of the participants ranged from 18 to 32 years old. There were 17 out of the 27 participants who were below the age of adulthood which is 20 years old. All others were in the young adulthood stage of 20–40 years old. In the experimental group, 11 (73.33%) were in the 18–20-year-old range, 2 (13.33%) were in the 21–23-year-old range, and 1 (6.67%) in both the 24–26- and 27–29-year-old age range. The control group has 10 students (62.50%) belonging in the 18–20-year-old range, 4 (25%) in the 21–23-year-old bracket, and 1 (6.25%) each in the 27–29- and 30–32-year-old age range. The expected ages of students who are now in their third year in college is 19–20 years old while those who were 21 years old and above were either second coursers, returning students from a leave of absence, or repeaters.

There were 27 female students and 4 male students who participated in the study. The study participants were mostly female from both the experimental and control groups. Out of the 15 participants in the experimental group, 13 are female. Of the control group, 14 out of 16 were female. Both groups have two males each.

The lowest PsGPA is 2.2 while the highest is 3.2. There were 12 participants in the experimental group whose PsGPA belongs to the 2.2–2.5 range, 2 in the 2.51–2.8 range, and 1 in the 2.8–3.2 range. Among those in the control group, there were 11 participants in the 2.2–2.5 range, 4 in the 2.51–2.8 range, and 1 in the 2.8–3.2 range. Except for those in the 2.51–2.8 range where the difference is half (2 against 4), the 2.2–2.5 range (12 against 11) have more or less a similar number (Table 1). The grade point average of the professional subjects already taken by the students was used as a basis for distributing them equally to the experimental and control groups. The PsGPA of 4.0 is the highest possible mark that a student can obtain, and a PsGPA of 2.0 is the required average for a student to be retained to continue the course.

Table 1. Profile of Respondents

	Experimental group (%)		Control group (%)	
Age				
18–20	11 (35.48)		10 (32.25)	
21 and above	4 (12.9)		6 (19.35)	
Gender				
Female	13 (41.9)		14 (45.16)	
Male	2 (6.45)		2 (6.45)	
PsGPA				
2.2–2.5	12 (38.70)		11 (35.48)	
2.51 and above	3 (9.68)		5 (16.12)	
Scores	**Pretest**	**Posttest**	**Pretest**	**Posttest**
11–14	8	10	9	8
15–20	7	5	7	8

The pretest scores between the experimental and control groups registered a p value of 0.651 which is not significant. The posttest scores between the experimental and control groups have a p value of 0.491 which is also not significant. The mean of the pre- minus posttest scores of the experimental and control groups revealed a p value of 0.961 which is not significant.

Table 2. Test for significance of difference between means of independent samples.

Variables	Compared groups		Results
	Experimental	**Control**	
Pretest scores	**Mean = 11.2667**	**Mean = 11.6875**	$\sigma_1^2 = \sigma_2^2$
	sd = 2.81493	sd = 2.30127	$t = -0.457$
			p value = 0.651
			Not significant
Posttest scores	**Mean = 13.800**	**Mean = 14.25**	$\sigma_1^2 = \sigma_2^2$
	sd = 1.61245	sd = 1.9494	$t = -0.698$
			p value = 0.491
			Not significant

Pre-minus posttest results	**Mean = -2.533**	**Mean = -2.5625**	$\sigma_1^2 = \sigma_2^2$
	sd = 2.16685	sd = 1.82460	$t = -0.041$
			p value = 0.968
			Not significant

The study revealed that there is no significant difference in the mean scores of both the experimental and control groups and in the pretest and posttest mean scores in the two groups.

As shown in Table 2, the p value of 0.651 was recorded in the comparison of mean scores in the pretest between the experimental and control groups. This is expected by the researchers considering that both groups were organized to be homogenous based on the selection process. The ranking of their PsGPA was done and was alternately distributed to the control and experimental groups based on the ranking. The participants were also exposed to the topics covered in the pretest since they were discussed in level II. Basing on Dewey's model, this forms part of the previous knowledge or knowledge base of the participants.

The p value of 0.491 was recorded in the mean scores of the posttest results between the experimental and control groups. The hypothesis is thus accepted that there is no significant difference in the introduction of clinical simulation in the cognitive ability of the study participants. The control group who did not undergo clinical simulation recorded a mean score of 2.5625 while the experimental group was 2.533. The results suggest that there is no significant difference in terms of the scores. The pretesting tool and posttesting tool utilized were the same. The control group took the posttest right after the review while the experimental group took the posttest later in the afternoon after their clinical simulation exposure.

According to Johnson and Johnson (1986), there is persuasive evidence that cooperative teams achieve at higher levels of thought and retain information longer than students who work quietly as individuals. The shared learning gives students an opportunity to engage in discussion and take responsibility for their own learning, thus they become critical thinkers (Totten, Sills, Digby, & Russ, 1991); this is seen as attributable to the homogeneity of the group in terms of cognitive ability and the irrelevance of additional learning strategy such as clinical simulation to enhance their knowledge base. The clinical simulation is more focused on enhancing the application of this knowledge to improve affective and psychomotor domains of learning.

Participants from both groups underwent a lecture on the topic in their regular classes. They were given a review on the specific topic for 1 hour and 30 minutes on the day they will take the test. There was an interval of 5 hours and 30 minutes in taking the posttest by the experimental group whereas the control group took the posttest 30 minutes after the review of the topic. Explicit measures of human memory, such as recall or recognition, reflect conscious recollection of the past. Implicit tests of retention measure transfer (or priming) from past experience on tasks that do not require conscious recollection of recent experiences for their performance (Roediger, 1990). The posttest must be administered at the same time, after the lapse of the same period of time, and the control group was not allowed to review further by themselves in the interim.

The pre- minus posttest results recorded a p value of 0.968. This showed that the intervention which is the exposure to clinical simulation did not effectively create a difference in terms of the resultant scores in the posttest. This is seen again as a reminder that cognitive domain cannot be improved with the use of clinical simulation especially when the knowledge base of these students was already concreted by other methods. Once the cup is full, it can no longer be added with so much more. The clinical simulation with the use of high-fidelity patient simulator did not enhance the sufficient cognitive knowledge these students already possessed. Mastery level of the concept and subject matter harnessed by other methods is more effective than applying the same to a near or close to real scenario using a high-fidelity simulator. Studies have shown that bringing learners together in a simulation scenario can improve communication, decision-making, judgment, and leadership skills (Moorthy, Munz, Adams, Pandey, & Darzi, 2005). "That, although clinical simulation is resource heavy, it has been shown to be feasible and instructive technique for teams (Hunt, Heine, Hohenhaus, Luo, & Frush, 2007). Improved individual and team responses were appreciated in both individuals and teams in acute and ambulatory care (Creutzfeldt, Hedman, Medin, Stengard, & Fellander-Tsai, 2009), making simulation more beneficial and effective in developing skills."

Tables 2 and 3 show that there were significant differences in the means of the pretest and posttest scores in both groups. The mean of the pretest against the posttest in the experimental group revealed a significant value.

The same is true when the pretest and posttest means in the control group were tested for significance. This shows that there is no difference in the performance of both groups in terms of test scores in the pre- and posttests. This further shows that clinical simulation as an intervention introduced to the experimental group has not generated a significant difference compared with that of the control group which registered a significant increase in their mean scores against the pretest. This shows that, although a significant increase in the test scores was appreciated after exposure to clinical simulation in the experimental group, there was also a significant increase in the test scores in the control group even if they were not exposed to clinical simulation. Aggarwal et al. (2010) stated that it is currently accepted that simulators serve as an adjunctive tool and not a replacement of other teaching methodologies. This is again conclusive of the results of the study that the introduced intervention was not effective in making a difference in terms of enhancing cognitive ability of the students.

In terms of raw scores, the posttest marks of the students in the control group were higher than those of the experimental group, considering the difference in the amount of time in the conduct of the posttests. The control group took the posttest 2 hours and 30 minutes after the pretest and 30 minutes after the review while the experimental group took the posttest 7 hours and 30 minutes after the pretest, 5 hours and 30 minutes after the review and underwent the rigors of clinical simulation. This can be reflective of how recent recall of concepts can assist in recalling/retention of memory that can assist in getting high scores compared to the pretest.

Table 3. Test for significance of difference between means of related samples.

Groups	**Compared results**		**Results**
	Pretest	**Posttest**	
Experimental	Mean = 11.2667	Mean = 13.8000	Mean of differences = −2.533
	sd = 2.81493	sd = 1.61245	
			Wilcoxon test:
			$z = -2.939$
			p value = 0.003

			***t* test:**
			$t = -4.528$
			p value = 0.000
			Significant
Control	Mean = 13.800	Mean = 14.25	Mean of differences = −2.53625
	sd = 1.61245	sd = 1.9494	$t = -5.618$
			p value = 0.000
			Significant

The test for significance of the relationship between the exposure of the participants to clinical simulation and their cognitive ability revealed a p value of −0.968 which is not significant. This means that the cognitive ability of students and their exposure to clinical simulation are not related significantly. The exposure of students to clinical simulation has no significant effect on the students' performance in the examination. The scores obtained in the posttest among the participants in the experimental group cannot be attributed to the exposure to clinical simulation. This will again confirm the effective admission screening implemented by the unit in the selection of the students. This also shows that the participants are on the same baseline level as to their knowledge as reflected by their homogenous grouping in terms of their PsGPA. They reflect the same capability to learn with or without additional exposure to clinical simulation that will cement their theory base. This is the gap in the theory and in application as a process of cementing and enhancing knowledge. It could be argued that beginning nursing students will have a higher need and lesser knowledge and skills to pin their simulation experience in comparison with more experienced and knowledgeable senior students.

Table 4. Test for significance of the relationship between two variables.

Posttest scores	**Treatment**		**Results**
	Experimental	**Control**	
11–12	3	3	$r_{eta} = 0.008$
13–14	7	5	$r_{pb} = -0.008$
15–16	4	6	p value = 0.968
17–18	1	2	

			Not significant
Total	15	16	

As shown in Table 4, there were three participants exposed to clinical simulation that recorded posttest scores of 11–12, 7 had 13–14, 4 with 15–16, and 1 had 17–18, while the participants who were not exposed to clinical simulation recorded the following scores: 3 had 11–12, 5 had 13–14, 6 had 15–16, and 2 had 17–18. Statistical analysis revealed that, with a p value of 0.968, there is no significant relationship between the two variables. The cognitive ability of the students and their exposure to clinical simulation are not related significantly. The utilization of clinical simulation in the improvement of knowledge cannot be inferred. A high score in the posttest cannot be associated with one's exposure to simulation. This affirms the selection process during the admission of students to SUCN. The stringent measures adopted in the selection process to ensure that the cognitive capabilities of those admitted are of the same level. They were given the same baseline knowledge and reinforcement in the form of a review. The simulation did not significantly affect their appreciation of the knowledge gained from the strategy. It is good to note that, in the experimental group, there was a considerable increase in the students' earned points in the posttest. There were 3 who got at least 15 correct marks in the pretest, and this increased to 5 in the posttest. The control group has marked a higher data wherein only 2 got at least 15 correct marks in the pretest, but there were 7 who got at least 15 in the posttest. This can be attributed to the fact that the participants in the control group had the time to recall their pretest mistakes during the posttest which was administered only after a shorter period of time than that of the experimental group. They were not exposed to a stressful situation like what the experimental group went through.

The exposure of students to clinical simulation has no significant effect on their cognitive ability. Other methods of learning like lecture-discussion and self-study remain sufficient in the grasp of specific concepts. Clinical simulation is more inclined to the improvement of psychomotor and affective skills as previous studies will show that there is a need to alter teaching methods to fit the demands of the student learners today (Medley & Horne, 2005). Simulation is an innovative and technologically advanced teaching and learning approach that combines a problem-based approach with experiential learning where the student learns through "doing," "experiencing," and utilizing their knowledge base, psychomotor skills, and clinical decision-making based on the information before them (Edgecombe, Seaton, Monahan, Meyer, LePage, & Erlam, 2013). Jeffries (2007) further stated that "simulation is a practice that resembles reality and has existed in nursing education in many forms" (p. 10).

CONCLUSIONS

The exposure of students to clinical simulation has no significant effect on their cognitive ability. Although there is a slight improvement as far as the posttest results between the experimental and control groups are concerned, this is not enough to justify a correlation between clinical simulation and cognitive ability. Other methods of learning like lecture-discussion and self-study remain sufficient in the grasp of specific concepts as shown in this study.

The program coordination in the University must emphasize the use of clinical simulation in enhancing psychomotor and affective skills and in addition to cognitive abilities of the students. Since nursing is a practice profession, the use of high-fidelity mannequin is utilized to mark and evaluate performance of students; it must be on the skills only and must not capitalize on theory. Although basic knowledge of a specific clinical simulation scenario is needed to appropriately intervene, there is no guarantee that such cognitive grasp of the knowledge will be further enhanced by the clinical simulation exposure. The goal of any educational intervention, whether it is a focused skill, simulation-based scenario, clinical decision-making, or team work exercise, is to increase the knowledge and breadth of the students' learning. From this, the teacher needs to utilize the best practices in using simulation as a teaching method. The Commission on Higher Education Memorandum provides that simulation is encouraged but will not replace the classroom and clinical hands on experience.

Simulation is an interactive and innovative teaching and learning strategy that has an opportunity to provide effective consolidation of clinical knowledge and skills into nursing practice. As a teaching method, simulation requires thorough planning and organization to ensure relevance to clinical nursing practice, the student participants, and the clinical environment. There must be strict adherence to carefully constructed scenarios.

It is necessary for simulation-based training to be fully integrated and funded within training programs for clinicians at all stages. It is also necessary to train the trainers through the development of a skilled faculty of expert clinical facilitators, supported by adjunctive support staff in dedicated simulation suites. Further research is needed to extend the use of simulation to serve as a tool in identifying credentialing in specialized areas, revalidation of previously learned skill, and learning new technologies. There must also be a move away from using experience as a proxy for competence. The analysis and evaluation of a practitioner's skills must be done regularly and must be continuous with competence being a work in progress and elusive in nature.

RECOMMENDATIONS

This study may be replicated by other researches by using a larger number of participants to make the study more rigorous. In addition, participants from other nursing schools may be included in the sample to initiate the adoption of simulation-based education.

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