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**Citation for published version:**

Karkada, S, Radhakrishnan, J, Natarajan, J, Matua, GA & Kaddoura, M 2019, 'Knowledge and competency of novice nursing students in nasogastric tube feeding: Is simulation better than case scenario?', *Oman medical journal*, vol. 34, no. 6, pp. 528-533. <https://doi.org/10.5001/omj.2019.96>

**Digital Object Identifier (DOI):**

[10.5001/omj.2019.96](https://doi.org/10.5001/omj.2019.96)

**Link:**

[Link to publication record in Edinburgh Research Explorer](#)

**Document Version:**

Publisher's PDF, also known as Version of record

**Published In:**

Oman medical journal

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# Knowledge and Competency of Novice Nursing Students in Nasogastric Tube Feeding: Is Simulation Better than Case Scenario?

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## ARTICLE INFO

### Article history:

Received: 17 October 2018

Accepted: 17 March 2019

### Online:

DOI 10.5001/omj.2019.96

### Keywords:

Self Confidence; Female; Students, Nursing; Clinical Competence; Personal Satisfaction; Oman; Enteral Nutrition; Learning.

## ABSTRACT

**Objectives:** As the millennial generation enters the nursing profession, simulation takes on a key role in effective pedagogy. We sought to examine the efficacy of simulation versus case scenario as a teaching method for novice nursing students in the skill of nasogastric tube (NGT) feeding. We assessed the knowledge, competency, self-confidence, and satisfaction among these nursing students. **Methods:** This quasi-experimental study was used to compare the efficacy of simulation and case scenarios in promoting knowledge, clinical competency, self-learning, and self-confidence among novice nursing students in the Middle East. The study sample included 69 students registered for the Fundamentals of Nursing Laboratory course at the College of Nursing, Sultan Qaboos University, Oman, during the spring and fall 2016 semesters. Thirty-five students were assigned to the intervention group and attended a simulation, while 34 students were assigned to the control group and were given the standard case scenario used in teaching this course. The competency of the students on NGT feeding skill was measured after a simulation or case scenario. **Results:** In both groups, the majority of students were  $\leq 20$  years old, female, hailed from rural areas, and had a cumulative grade point average of  $> 2.5$ . Data showed a significant improvement in the mean scores of competency between the intervention and control groups ( $t_{(67)} = 3.869, p < 0.001$ ) suggesting that simulation was effective in gaining competency compared to the case scenario. There was a positive statistical significance between satisfaction and self-confidence among the intervention group. **Conclusions:** Simulation has an effective role in clinical education for teaching practical skills. However, in this study, there was a statistically significant difference in the mean scores between the two methods of teaching. This helped us to conclude that competency gained by novice students' learning a skill through simulation, was better than the competency gained through case scenario. We recommend simulation as an effective pedagogy among novice nursing students.

The growing complexity of clinical environment continues to exert increasing challenges that demand nurse educators seek innovative pedagogies to equip students with the required confidence, clinical reasoning, critical thinking skills, and competencies.<sup>1</sup> As the millennial generation enters the nursing sector, simulation takes on a key role in effective pedagogy. Innovative pedagogies have taken momentum in shaping the nursing curriculum, and simulation has emerged as a significant method in teaching clinical courses. The literature on nursing education

shows that simulation is useful in creating a strong learning environment, contributing to knowledge acquisition as well as increased awareness for safety and improved student confidence.<sup>2,3</sup> Hence, there is an increasing trend of using simulation as a teaching strategy for imparting knowledge and competency even to novice nursing students.<sup>4</sup>

Globally, simulation is recognized in several landmark studies as an effective teaching-learning method. Although primarily used in applications in the military, nuclear power, and aviation, simulation has been integrated into the education

of nurses for the last 20 years.<sup>5</sup> As a practice-based profession, the nursing curriculum must provide opportunities for students to repeatedly practice required competencies in a conducive working environment without fear of harming patients.<sup>6</sup> Although traditional teaching methods provide this opportunity in the nursing laboratory, they generally cannot simulate the challenges inherent in a clinical environment. Simulation as a teaching/learning method introduces the dynamism of a clinical environment and prepares students to deal with real situations.<sup>7</sup>

The emphasis on simulation is often on the application and integration of knowledge, skills, and clinical judgment. Some studies suggest that simulation has a considerable increase in knowledge,<sup>8-11</sup> competence, self-efficacy,<sup>12</sup> and confidence.<sup>11</sup> Students reported increased self-confidence,<sup>13,14</sup> self-efficacy, and satisfaction.<sup>7</sup>

Although simulation is increasingly used for teaching in developed countries, in Middle Eastern countries this has only recently started. Although simulation is increasingly appreciated and applied as a method of teaching, there are no studies evaluating the outcome of simulation in teaching novice nursing students within the context of the region. This research attempts to address that gap, adding to the existing knowledge on simulation as a teaching method in nursing in the Middle East, especially with novice nursing students, in enhancing their knowledge and competency. Some complicated procedures like injection, nasogastric tube (NGT) feeding, and urinary catheterization need concentrated practice by novice nursing students to excel in their competency. Therefore, the researchers were interested in introducing simulation among these novice nursing students taking fundamentals of nursing course. The purpose of this study was to examine the efficacy of simulation as a teaching method and compare it with case scenario for novice nursing students. The study also measured the knowledge and the role of simulation in imparting self-confidence and satisfaction among these nursing students. Hence, the research questions addressed were: what is the effectiveness of simulation in gaining knowledge and improving competency of performing NGT feeding among the novice nursing students and what is the relation between self-confidence and satisfaction among the students who underwent simulation?

## METHODS

In this quasi-experimental study, we assessed the knowledge and competency of 69 students registered for the Fundamentals of Nursing Laboratory course during the 2016 spring and fall (January to December) semesters at the College of Nursing, Sultan Qaboos University, Oman. The study included undergraduate direct entry students who were willing to participate and consented to the study. Ethical clearance was obtained from the College of Nursing Research and Ethics Committee.

The subjects were divided into intervention and control groups. At Sultan Qaboos University, students are admitted under different class sections: 35 students of section 20 were assigned to the intervention group and attended a simulation, while 34 students of section 10 were assigned to the control group and were given the standard case scenario used in teaching this course.

The researchers used standardized instruments to collect data. (i) Demographic Proforma - Code numbers were assigned to each student representing age, gender, cohort of study, cumulative grade point average (CGPA), and home region. (ii) Cognitive Gain Tool - A researcher-designed test was developed to measure the understanding of NGT feeding, consisting of 10 multiple-choice questions. This test was based on the current National Council Licensure Examination testing as well as the researcher's goal of evaluating students' abilities to recall information (as opposed to recognition). Experts reviewed the items for validity, and its reliability was 0.88. Each question had one correct answer. Hence, the minimum score was zero, and maximum score was 10. (iii) The Creighton Competency Evaluation Instrument (CCEI) - A 23-item tool used by clinical instructors to rate students on behaviors that collectively demonstrate clinical competency (assessment, communication, clinical judgment, and patient safety). This tool was used to assess students in the two settings (clinical and simulation) in previous research studies. The detailed validity and reliability statistics as reported by Hayden et al,<sup>15</sup> which show that the overall Cronbach's alpha coefficient ranged from 0.974 to 0.979, which is considered highly acceptable. Furthermore, the percentage of agreement between the faculty raters of the reliability and validity studies and an expert rater was 70% or higher for 20 out of 23 items.<sup>15</sup> (iv) Student Satisfaction and Self-Confidence

in Learning Scale – Developed by the National League for Nursing and used to determine novice students' satisfaction with the simulation of the skill NGT feeding. Furthermore, this scale was used to determine students' self-confidence in applying skills learned from the simulation to future patients. The scale consisted of 13 statements based on a 5-point Likert scale with responses ranging from 'strongly disagree' to 'strongly agree'. The student satisfaction with learning scale consisted of five statements with a Cronbach's alpha reliability of 0.94.<sup>13</sup> The self-confidence in learning using simulations scale consisted of eight statements with Cronbach's alpha reliability of 0.87.<sup>13</sup> As a further measure of quality control, the content validity of both instruments was established by nine experts.<sup>13</sup>

The intervention was administered over three days. On the first day, the 69 registered students attended a two-hour theory session on the topic of human nutrition and NGT feeding, forming the basis of the intervention. On the second day in the skills laboratory session, the students' knowledge and demographic characteristics were assessed using standardized questionnaires. This was followed by a demonstration of the NGT feeding procedure by assigned clinical instructors, who are part of the fundamentals of nursing lab course and were involved in this research.

Following the pre-test, the intervention group was given the simulation of NGT feeding procedure, and the control group was given the usual case scenario

regarding NGT feeding. After this simulation practice and case scenario discussion, both groups were subjected to post-test measurements using the CCEI National League for Nursing questionnaire on self-confidence and self-satisfaction and the cognitive gain tool. The pre- and post-test data were collected by four trained nursing faculty who were involved in teaching the course, and only two were part of the study.

## RESULTS

Data were analyzed using SPSS Statistics (IBM Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.). In both the control and intervention group, the majority of students were  $\leq 20$  years old, females, hailed from rural areas, and had a CGPA of  $> 2.5$  [Table 1]. The data did not show any statistically significant association between the pre-test categories and the selected variables ( $p > 0.050$ ), implying a homogenous sample in both groups before the study.

There was no significant difference in the mean scores of knowledge between groups before and after the intervention, or between the groups, showing that the knowledge scores were independent of the intervention [Table 2]. Data showed a significant improvement in the mean competency scores indicating that both simulation and case scenario were effective in improving student competencies

**Table 1:** Chi-square values of the variables with the pre-test knowledge category.

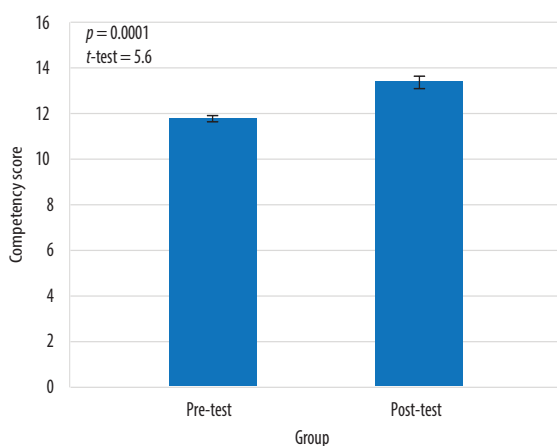
Variables	Control group (n = 34)		$\chi^2$ (p-value)	Intervention group (n = 35)		$\chi^2$ (p-value)
	f	%		f	%	
<b>Age, years</b>						
≤ 20	33	97.1	2.862 (0.0910)	29	82.9	0.054 (0.817)
> 20	1	2.9		6	17.1	
<b>Gender</b>						
Male	7	20.6	0.200 (0.650)	13	37.1	0.551 (0.458)
Female	27	79.4		22	62.9	
<b>Residence</b>						
Rural	28	82.4	0.360 (0.540)	25	71.4	1.393 (0.238)
Urban	6	17.6		10	28.6	
<b>CGPA</b>						
≤ 2.5	13	38.2	0.020 (0.880)	11	31.4	0.504 (0.478)
> 2.5	21	61.8		24	68.6	

CGPA: cumulative grade point average.

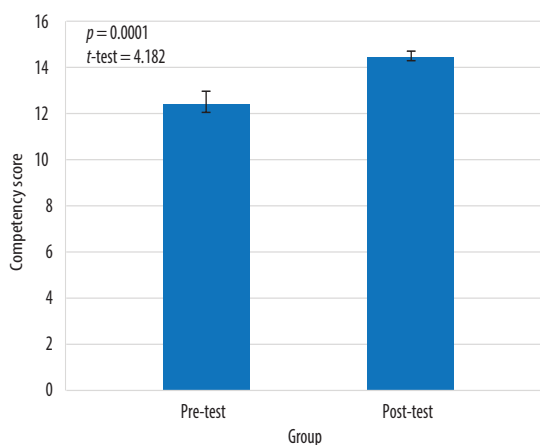
**Table 2:** Comparison of mean scores and standard deviation (SD) of pre- and post-test knowledge scores between the intervention and control group.

Group	Mean	SD	t-test	df	p-value
<b>Pre-test</b>					
Intervention	4.4	1.5	2.242	67	0.028
Control	3.7	1.3			
<b>Post-test</b>					
Intervention	4.9	1.5	-0.240	67	0.810
Control	5.0	1.4			

df: degree of freedom.



**Figure 1:** Competency scores of the control group before and after case scenario.



**Figure 2:** Competency scores of the intervention group before and after simulation.

( $p < 0.001$ ) [Figure 1 and 2]. The  $t$ -test computed between the post-test scores of competency between the intervention and the control group showed a statistically significant difference in the mean scores between the two teaching methods ( $t_{(67)} = 3.869$ ,

**Table 3:**  $t$ -test and comparison of mean scores and standard deviation (SD) of post-test competency between the intervention and control group.

Group	Mean	SD	t-test	df	p-value
<b>Post-test</b>					
Intervention	14.6	0.98	3.869	67	< 0.001*
Control	13.4	1.6			

df: degree of freedom.

$p < 0.001$ ), suggesting that simulation was better in improving the competency than case scenario [Table 3]. The results shown in Figure 3 indicate a positive statistical significance between satisfaction and self-confidence. Students who were satisfied had better self-confidence in performing the procedure in the intervention group.

Table 2 compares pre- and post-test in terms of participants' knowledge. The data shows no significant difference in the knowledge mean scores between groups before and after the intervention.

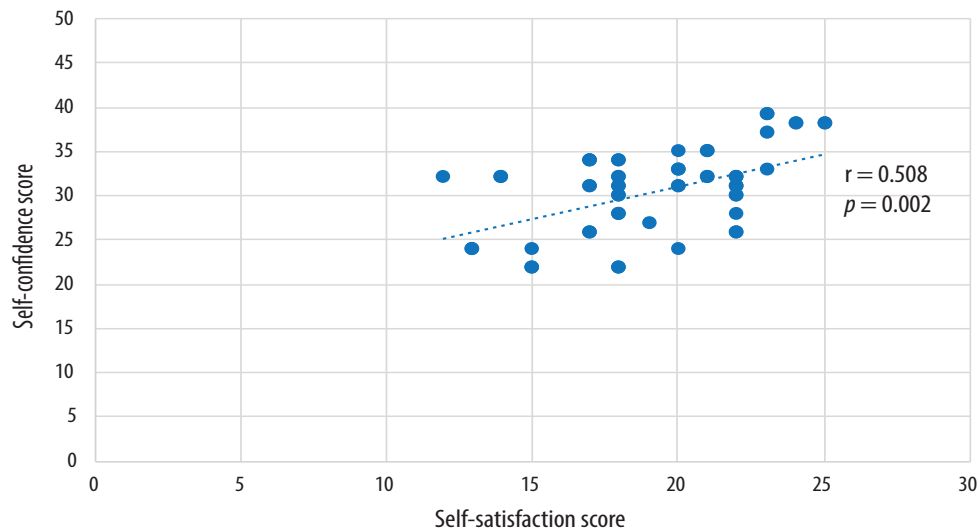
We observed a significant improvement in the mean post-test scores in competency for the control group following the case scenario [Figure 1]. This was also the case for the intervention group [Figure 2].

We found a positive statistical significance between satisfaction and self-confidence [Figure 3].

We found a significant difference in the mean competency scores between the control and intervention group [Table 3]. Hence, it was inferred that simulation was effective in improving the competency of the students compared with case scenario in performing NGT feeding.

## DISCUSSION

Advanced technology accessible for the millennial generation of nursing students has created opportunities for nurse educators to use simulation as a teaching strategy. This study was a preliminary investigation into the efficacy of simulation as a best practice among novice nursing students compared to the case scenario method. The current study provides empirical data of simulation-based nursing education with first-year nursing students with respect to knowledge, competency, satisfaction, and self-confidence. The results reveal that both case scenarios and simulation-based learning had a positive impact on improving the knowledge and



**Figure 3:** Correlation between self-confidence and self-satisfaction score in the intervention group.

competency of novice nursing students. However, there was a statistically significant difference in the mean post-test scores of competency, leading to the conclusion that simulation was better than the case scenario. Similarities between the current study and previous findings<sup>16,17</sup> are evident. Other studies have reported satisfaction with learning and level of self-confidence,<sup>17,18</sup> as well as improved communication and clinical reasoning with simulation and the use of standardized patients as teaching strategies for undergraduate nursing students.<sup>7</sup>

Students who were satisfied with the simulation learning perceived higher levels of competency to perform the requisite nursing skills. This is similar to the findings of other recent, similar studies, which revealed a positive association between simulation, satisfaction, and self-confidence.<sup>3,19,20</sup>

Available literature in simulation and nursing education provides evidence on improved learning outcomes of nursing students in various aspects including knowledge, competency, clinical reasoning, communication, teamwork, and patient safety.<sup>3,7,21–26</sup> This study is the first to evaluate the effectiveness of simulation-based learning among novice nursing students in the Middle East, a vast region spanning 12 countries with over 218 million people. In evaluating research, the results need to be carefully weighed based on the cost-effectiveness of the two teaching strategies. It can be concluded that simulation as a best practice could be utilized in first level nursing courses because students exposed to this method report a higher perception of satisfaction and self-confidence. However, questions remain as

to whether a simulated learning environment would help novice nursing students retain and transfer the learning outcomes in actual clinical settings. Further research is needed to evaluate the knowledge, student performance, satisfaction, and self-confidence in the clinical setting after simulated learning experiences.

Our study was limited by its small sample size, as the estimated sample size of 80 was not available within the study period of spring and fall 2016. Hence, the results are limited to the participants of the study. Another limitation is the inter-observer error/difference in the assessment of competency with four observers. These limitations may affect the generalizability of the findings to other populations and clinical settings.

Based on our findings, we recommend the following:

1. Conducting a comparative cross-sectional study to evaluate simulation effectiveness across different courses.
2. Assessing the follow-up of clinical skills competency.
3. Conducting similar studies with other complex nursing procedures (e.g., wound dressing and medication administration).

## CONCLUSION

This study has various implications for nursing education, practice, and research. Simulation is a very effective tool for teaching practical skills. However, we found a statistically significant difference between the two methods of teaching. This helped us to

conclude that competency gained by novice students' learning a skill through simulation, was better than the competency gained through case scenario. However, simulation can be used for teaching vital skills to the students (especially novices) in a safe environment without the fear of making mistakes. Curriculum planners could dedicate 5–10% of clinical experience to simulation in level one and two courses.

### Disclosure

The authors declared no conflicts of interest. The study was supported by the Dean's Fund for Research, College of Nursing, Sultan Qaboos University, Muscat, Oman.

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