REVISTA DE ENFERMAGEM REFERÊNCIA
homepage: https://rr.esenfc.pt/rr/
ISSNe: 2182.2883

RESEARCH ARTICLE (ORIGINAL)

Simulated hand hygiene practice and self-efficacy in nursing students

Práctica simulada del lavado de manos y autoeficacia en estudiantes de enfermería

Prática simulada de higiene das mãos e autoeficácia em estudantes de enfermagem

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Received: 14.02.24
Accepted: 09.10.24

Abstract

Background: Nursing practice is crucial to the education of nurses. However, education based on traditional practice is no longer sufficient. Therefore, simulated practice has emerged as an innovative strategy to address this need.

Objective: To compare self-efficacy before and after simulated hand hygiene practice.

Methodology: A quantitative pre-experimental study was conducted with a sample of 56 nursing students from a public university. A validated version of the General Self-Efficacy Scale was used to measure outcomes.

Results: There were significant differences in self-efficacy before and after simulated practice (Z = -6.52; p < 0.001), with higher mean and median self-efficacy scores being reported after simulation ($\bar{X}$ = 45.31; *Mdn* = 43.75 vs. $\bar{X}$ = 88.28; *Mdn* = 93.75).

Conclusion: The results provide evidence for the positive effect of simulated practice on self-efficacy. This confirms the relevance of this teaching-learning strategy in nursing education as it represents an innovative tool for improving health care.

Keywords: self-efficacy; hand disinfection; education; students, nursing

Resumen

Marco contextual: La práctica de enfermería ha sido fundamental en la formación de profesionales. No obstante, la educación basada en la práctica tradicional ya no es suficiente. La práctica simulada ha surgido como una estrategia innovadora para responder a esta necesidad.

Objetivo: Comparar la autoeficacia antes y después de la práctica simulada del lavado de manos.

Metodología: Estudio cuantitativo y preexperimental, con una muestra de 56 estudiantes de enfermería de una universidad pública. Se utilizó la Escala de Autoeficacia General para medir los resultados.

Resultados: Se identificaron diferencias significativas en la autoeficacia antes y después de la práctica simulada (Z = -6.52; p < 0.001), con puntuaciones superiores en las medias y medianas de autoeficacia tras la simulación ($\bar{X}$ = 45.31; *Mdn* = 43.75 *vs* $\bar{X}$ = 88.28; *Mdn* = 93.75).

Conclusión: Los resultados confirman el efecto positivo de la práctica simulada en la autoeficacia. Esto resalta la importancia de esta estrategia de enseñanza-aprendizaje en la disciplina de enfermería, lo que proporciona una herramienta innovadora para mejorar el cuidado.

Palabras clave: autoeficacia; desinfección de las manos; educación; estudiantes de enfermería

Resumo

Enquadramento: A prática de enfermagem é fundamental para a formação dos enfermeiros. Porém, a educação baseada na prática tradicional já não é suficiente. Neste sentido, a prática simulada surge como uma estratégia inovadora para responder a esta necessidade.

Objetivo: Comparar a autoeficácia antes e depois da prática simulada de higiene das mãos.

Metodologia: Foi realizado um estudo quantitativo e pré-experimental, com uma amostra de 56 estudantes de enfermagem de uma universidade pública. Para medir os resultados obtidos, foi utilizada uma versão validada da Escala de Autoeficácia Geral.

Resultados: Foram identificadas diferenças significativas na autoeficácia antes e depois da prática simulada (Z = -6,52; p < 0,001), com pontuações superiores nas médias e medianas de autoeficácia após a simulação ($\bar{X}$ = 45,31; *Mdn* = 43,75 vs $\bar{X}$ = 88,28; *Mdn* = 93,75).

Conclusão: Os resultados confirmam o efeito positivo da prática simulada na autoeficácia e salientam a importância desta estratégia de ensino-aprendizagem para a enfermagem enquanto ferramenta inovadora para melhorar os cuidados de saúde.

Palavras-chave: autoeficácia; desinfeção das mãos; educação; estudantes de enfermagem

How to cite this article: Candia Arredondo, J. S., Guzman Facundo, F. R., Esparza Almanza, S. E., Hernández Valles, J. H., & González Vázquez, A. (2024). Simulated hand hygiene practice and self-efficacy in nursing students. *Revista de Enfermagem Referência*, *6*(3), e24.24.34629. https://doi.org/10.12707/RVI24.24.34629

Introduction

Practice-based nursing is an essential educational methodology used to train nursing students. It provides students with the opportunity to develop skills and clinical judgment in order to anticipate critical situations and potentially make the difference between life and death (Díaz, 2022; Yusef et al., 2021).

However, in the last few years, traditional practice-based nursing education, according to which students are immersed in a clinical environment to provide direct patient care, has been considered insufficient. The opportunities to develop specific skills and encounter different learning situations are limited in real-life scenarios, particularly with regard to the pathophysiology of less common health conditions. Therefore, nursing students need new and innovative learning strategies (Gutiérrez et al., 2017; Verkuyl et al., 2018).

In recent years, simulated education, also known as simulation-based learning, has become increasingly relevant in health sciences and is now a key teaching strategy with significant weight in curricula. Its growing use is closely linked to concerns about quality, safety, and patient well-being, as it provides students with scenarios that faithfully replicate real-world clinical environments and allow them to develop skills, techniques, and abilities through observation and practice (Fernández-Asuyo et al., 2018).

Simulation-based learning is structured into the following phases: Briefing - in this phase, the facilitator gives a detailed explanation of the procedure, describes how the simulation session will be conducted, sets the objectives, and assigns the practical activities to the students; Simulation - during this phase, students are immersed in a simulated scenario that replicates a real clinical experience and practice the required skills using a clinical simulator; Feedback - in the final phase, a retrospective evaluation is carried out and a discussion of the students' performance is promoted (Mendoza-Maldonado & Barría-Pailaquilén, 2018).

Learning through simulated clinical practice offers a number of important advantages: 1 - Control over pathophysiological variables: students are given a broad and controlled perspective of health conditions and are able to understand them comprehensively; 2 – Maximization of the learning time: without the pressure of a deadline, students can take as much time as they need to acquire the necessary skills; 3 - Learning through failure: failure is seen as a natural part of the learning process and provides opportunities to discuss specific techniques and deepen knowledge; 4 - Promotion of self-evaluation: students can immediately identify their mistakes and achievements at each step of the process, which contributes to more effective learning; 5 - Repetition of procedures: in simulated environments, procedures can be repeated as often as necessary, which is not always possible in practice with real patients due to ethical reasons (McDonald, 1987). Therefore, simulated practice is an effective and dynamic learning strategy that provides immediate feedback. It also combines theoretical knowledge with the acquisition of practical skills and gives students a sense of confidence, security, and competence in nursing procedures (Astudillo et al., 2017; Kim, 2018).

Hand hygiene is a critical procedure performed before certain patient care procedures. There is a particular emphasis today on reinforcing this procedure given its importance in preventing the spread of healthcare-associated infections. Bandura's (2006) social cognitive theory of learning also highlights the importance of self-efficacy in the acquisition of knowledge and skills. Therefore, the acquisition of new nursing knowledge and skills and the development of nursing care behaviors are facilitated by self-confidence and the perception of being able to perform hand hygiene correctly (Sánchez & Hurtado, 2020). These concepts operate instrumentally through observation and imitation and act as cognitive factors that influence individuals' decisions to imitate what they observe. Thus, it is possible to affirm that simulated practice allows students to develop the confidence necessary to acquire new skills and competencies (Bandura, 1997).

Data have demonstrated the success of health promotion and self-efficacy procedures in real clinical situations. Perceived self-efficacy increased following the implementation of health promotion procedures, and several effects related to the level of self-efficacy following participation in simulation experiences were also identified. These effects include an increase in the self-efficacy levels of nursing students who participated in simulations, an increase in the control of emotions and feelings, a decrease in anxiety levels during critical situations associated with an increase in self-efficacy levels, an increase in motivation associated with an increase in the self-efficacy levels of students who trained in simulation environments, and a decrease in stress levels after participation in simulation experiences (Reyes et al., 2020; Kurnia et al., 2020).

Although perceived self-efficacy in nursing procedures plays a critical role in the development of specific healthcare skills, the practice of simulated scenarios in Mexico is still in development and there is limited information available (Reyes et al., 2020; Kurnia et al., 2020). In view of the above, and in line with the identified needs, it is crucial to study the relationship between self-efficacy and simulated practice in nursing. Such an analysis can guide the development of innovative educational models that promote the professional growth of nursing students during their education. Therefore, this study aims to compare self-efficacy before and after simulated practice.

Background

Simulated clinical practice is a teaching and learning methodology that enables nursing students to acquire clinical skills and competencies in a controlled and safe environment that simulates real-life healthcare situations. This methodology, which uses clinical scenarios to replicate real-life experiences, provides students with the opportunity to practice procedures under the supervision of expert instructors. In addition, simulated clinical practice helps to improve students' confidence, competence,

and safety before they encounter real clinical situations (Amaro-López et al., 2020).

The World Health Organization (WHO) defines hand hygiene as a systematic procedure using soap and water or an alcohol-based hand rub to kill germs and other microorganisms that can cause diseases. Hand hygiene is an essential procedure to prevent the transmission of infections, both in healthcare settings and in everyday life (Sánchez & Hurtado, 2020).

Self-efficacy is defined as the belief in one's ability to achieve one's goals. This concept is closely related to self-esteem and motivation and is dynamic, as it evolves and is directly influenced by the acquisition of new information and experiences. In turn, self-efficacy influences how well individuals perform. All these characteristics are fundamental for nursing students, making self-efficacy an essential indicator both during and after the training process (Bandura, 1997).

Research question

Does simulated hand hygiene practice increase self-efficacy in nursing students?

Methodology

A quantitative pre-experimental study was conducted with pretest and posttest assessments of simulated nursing practice (Burns & Grove, 2012). The study population included students in the third, fifth, and seventh semesters of the undergraduate nursing program at a public university in northern Mexico. The study sample consisted of 56 students (n = 14 third-year students, n = 12 fifth-year students, and n = 30 seventh-year students) who agreed to participate in the research by signing a consent form.

A personal data questionnaire with questions regarding identification data such as age, gender, semester, type of nursing procedure, and type of simulator was used to measure the variables in the study. In addition, an ad hoc instrument based on the Spanish version of the General Self-Efficacy Scale ([EAG] *Escala de Autoeficacia General*; Espada et al., 2012) was developed to measure self-efficacy for nursing practice. It consisted of four Likert-type questions with five response options ranging from "Not at all
true" to "Exactly true" (ability to apply the appropriate knowledge for the procedure, to identify and prepare the necessary material, to perform the procedure correctly, and to control stress during the procedure). It is worth noting that the instrument obtained a Cronbach's alpha coefficient of 0.88. For statistical purposes, the sum of the instrument was converted into indices from 0 to 100, according to which the higher the score, the higher the perceived self-efficacy for nursing practice.

The study complied with every ethical guideline established in the regulations of the Mexican General Health Law on Health Research (Reglamento de Ley General de Salud en materia de investigación para la salud de la Secretaria de Salud, 1987). After being invited, all students participated voluntarily in the study. The nature of the research was explained to them in detail, and it was made clear that under no circumstances would the research constitute an evaluation activity. After the participants signed the consent forms and before the questionnaires were administered, the objectives of the research and the importance of students' participation were reiterated. It was also highlighted that the questionnaires were anonymous in order to ensure the participants' privacy.

After the pretest questionnaires were administered, a simulated nursing practice training session was conducted according to a procedure manual prepared by investigators in the areas of women's health nursing, child and adolescent nursing, and critical care nursing. Eighteen low-, medium-, and high-fidelity simulators were used to reproduce 18 procedures that were organized according to complexity and taking into account the students' current semester.

Students were given a theoretical-practical course in the above procedures by the investigators before the simulated practice. The course had a duration of 20 hours distributed across one week. In the institution's simulation center for clinical nursing practice, students were also encouraged to familiarize themselves with the simulated clinical environment in each procedure as well as with each of the simulators and materials required. Following this, the development of nursing practice in simulated clinical scenarios took place. After three weeks, the posttest assessment of self-efficacy was administered.

After completing the posttest assessment, students were asked to return the questionnaires by placing them in sealed envelopes to maintain anonymity. Finally, the students were thanked for their participation in the study and given a training certificate. The questionnaires were kept by the principal investigator. IBM SPSS Statistics, version 24.0, was used to analyze the study data. Descriptive and inferential statistics were applied. The Kolmogorov-Smirnov test was used to determine the distribution of the study variables. Based on the results, the decision was made to use nonparametric inferential statistics, namely the Wilcoxon Sign test for repeated measures.

Results

The sample consisted of 56 undergraduate nursing students, who were mostly female (70%), and had a mean age of 20.23 years (SD = 2.08). Regarding the semester of the undergraduate nursing program attended, 25% of the participants were in the third semester, 24.1% were in the fifth semester, and 32.1% were in the seventh semester.

Table 1 shows the indicators of the students' self-efficacy perception before performing the simulated nursing practice. According to the information presented, only 28.6% of the participants answered "True" or "Exactly true" for applying knowledge appropriately, 26.7% for preparing the necessary materials, 19.7% for performing the procedure correctly, and 35.7% for coping with stress during the procedure.

Table 1

Indicators of perceived self-efficacy before simulated nursing practice

Indicator	*Not at all true %*	*Hardly true %*	*Moderately true %*	*True %*	*Exactly true %*
1. I can apply the appropriate knowledge for the procedure.	10.7	32.1	28.6	28.6	0
2. I can identify and prepare all necessary materials for the procedure.	12.5	28.6	32.1	19.6	7.1
3. I can perform the procedure correctly.	17.9	28.6	33.9	17.9	1.8
4. I can cope with the stress arising from the procedure.	7.1	19.6	37.5	25.0	10.7

Note. % = Percentage; *n* = 56.

Table 2 shows the indicators of perceived self-efficacy after the simulated nursing practice. Based on the results presented, 91% of the participants answered "True" or "Exactly true" for applying knowledge appropriately, 94.7% for preparing the necessary materials, 92.9% for performing the procedure correctly, and 94.7% for coping with stress during the procedure.

Table 2

Indicators of perceived self-efficacy after simulated nursing practice

Indicator	*Not at all true %*	*Hardly true %*	*Moderately true %*	*True %*	*Exactly true %*
1. I can apply the appropriate knowledge for the procedure.	0	0	8.9	33.9	57.1
2. I can identify and prepare all necessary materials for the procedure.	0	3.6	1.8	39.3	55.4
3. I can perform the procedure correctly.	0	1.8	5.4	28.6	64.3
4. I can cope with the stress arising from the procedure.	0	0	5.4	26.8	67.9

Note. % = Percentage; *n* = 56.

Table 3 shows the comparison between the central tendency measures of self-efficacy before and after simulated nursing practice, taking into account the semester attended by students. The results of the Kruskal-Wallis test revealed no significant differences as perceived self-efficacy scores before and after simulated practice did not differ according to the semester.

Table 3

Comparison between the central tendency measures of self-efficacy before and after simulated nursing practice by semester, according to the Kruskal-Wallis test.

Self-efficacy	Semester	$\bar{X}$	*Mdn*	*SD*	*Min.*	*Max.*	χ^2	*p*
Before	Third (*n* = 14)	38.83	37.50	22.49	12.50	81.25	2.29	0.317
	Fifth (*n* = 12)	40.62	40.62	21.06	0.00	68.75		
	Seventh (*n* = 30)	50.2	43.75	23.06	12.50	87.50		
After	Third (*n* = 14)	84.82	93.75	19.25	43.75	100.00	3.49	0.174
	Fifth (*n* = 12)	83.33	78.12	14.91	56.25	100.00		
	Seventh (*n* = 30)	91.87	100.00	11.02	62.50	100.00		

Note. $\bar{X}$ = Mean; *Mdn* = Median; *SD* = Standard deviation; *Min.* = *minimum value; Max.* = *maximum value;* χ^2 = Chi-squared; *p* = Significance; *n* = 56.

Table 4 shows the comparison of the central tendency measures of self-efficacy before and after simulated nursing practice according to the Wilcoxon Sign test. The results reveal statistically significant differences, indicating an increase in self-efficacy for nursing practice after simulation. Figure 1 graphically illustrates the increase in self-efficacy after simulated practice.

Table 4

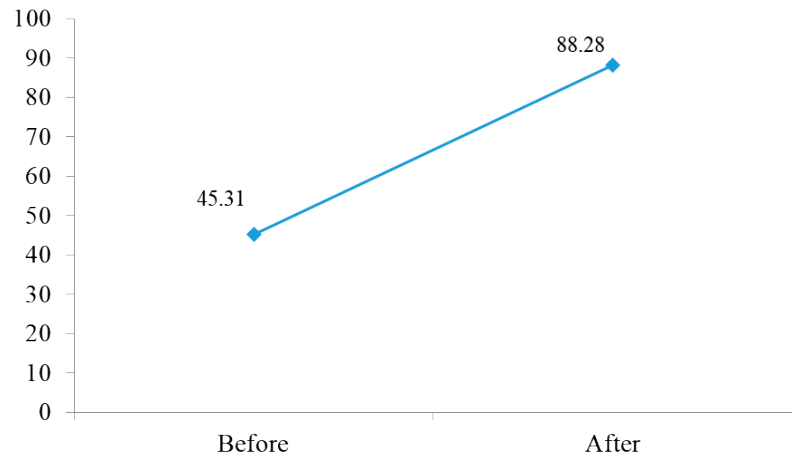
Wilcoxon Sign test for self-efficacy before and after simulated nursing practice

Self-efficacy	$\bar{X}$	*Mdn*	*SD*	*Min.*	*Max.*	*Z*	*p*
Before	45.31	43.75	22.77	0.00	87.50	7.35	.001
After	88.28	93.75	14.55	43.75	100.00		

Note $\bar{X}$ = Mean; *Mdn* = Median; *SD* = Standard deviation; *Min.* = minimum value; *Max.* = maximum value; *Z* = Wilcoxon Sign test; *p* = Significance; *n* = 56.

Figure 1

Self-efficacy comparison before and after simulated nursing practice



Discussion

In response to the study objective, the Wilcoxon Sign test proved the significance of the results. In other words, students answered "True" or "Exactly True" when asked if they felt more able after simulating specific procedures according to their level of training. Thus, simulated practice represents a useful learning strategy for nursing education, as students are required to develop the intended skills in each simulated procedure, which allows them to demonstrate their expertise in identifying materials, performing the procedures, and coping with stress. These results are consistent with previously published studies (Caraguay & Carrión, 2024; Coyne et al., 2021; González et al., 2023; Plotzky et al., 2021).

This study observed an increase in terms of theoretical knowledge between before and after simulation, thus the perceived ability to apply knowledge appropriately was higher after simulated practice. Although knowledge is first acquired in the classroom, several authors have recommended the development of critical judgment to support cognitive skills (Condezo et al., 2021; Morales-Rojas et al., 2021).

Several studies are also unanimous in considering critical judgment as a preamble to correct and immediate procedures that benefit patient care and safety (Hussein et al., 2022; Yusef et al., 2021).

However, as mentioned by Cuenca et al. (2022), it is worth noting that knowledge can be consolidated over time. Therefore, it is important to consider the frequency of simulated practices. In this study, the procedures were performed only once and during a predetermined period, between 15 and 25 minutes, depending on their complexity. Nevertheless, the positive results obtained seem to indicate that increasing the frequency of simulated practice can improve knowledge acquisition to a greater extent.

There was also an increase between before and after simulation in the perceived ability to identify and prepare the necessary materials for the procedures. Thus, the visualization and preparation of each material, as well as its use during the procedure, contributed to the improvement of competence, skill, and practice. Simultaneously, as students collected specific materials, the associations of ideas created allowed them to cognitively connect the information and combine their knowledge of anatomy, physiology, time logistics, and movement. It also allowed them to reinforce information and build confidence by controlling the elements that make up the procedures as a whole. Caballero Muñoz et al. (2020) and Valencia et al. (2019) reported similar observations in their studies.

The data on the correct performance of the procedures showed significance and higher percentages, which means that there was greater self-efficacy after the simulated practice. Students considered the action of performing the procedure correctly from beginning to end, using the correct techniques, and demonstrating the skills in a direct way to be the most meaningful to them, as it gave them security and confidence and made them feel ready to face real scenarios. From a teaching point of view, these results indicate that simulated practice is an appropriate learning strategy for the new generations and adds value to traditional practice, as suggested by authors such as Burgos (2020) and Valencia et al. (2019).

This study also observed greater levels of self-efficacy regarding the ability to cope with the stress that may result from the procedures after simulated practice. By applying theoretical knowledge, identifying the materials needed, and performing the correct actions, students can create a comfort zone that helps them reduce and cope with stress. In addition, the development of self-confidence through simulated practice can help students deal with the expected anxiety levels of real-life scenarios. Increasing the frequency of practice is also thought to improve and strengthen these conditions (Maldonado et al., 2022).

Finally, the study did not find any significant differences regarding the semesters attended by the students. Therefore, simulated practice should be used as a learning strategy from the first to the last year of the nursing education program (Díaz, 2022).

Conclusion

Self-efficacy increases after simulated practice because students are able to apply the theoretical knowledge previously acquired in the classroom and develop critical judgment. In addition, they are able to identify all the materials needed to perform the procedures. Students develop self-efficacy when they can perform the procedure correctly from start to finish, improve their practical skills, and cope with and reduce stress. This creates safety and confidence and leads to the conclusion that they are ready for real clinical practice.

Therefore, simulated practice should be integrated into the educational programs of health sciences. In nursing, it is recommended that simulated practice be used as a supplement to coursework under the supervision of an instructor with clinical experience. In addition, it is suggested that more clinical simulation spaces be opened and expanded, and that research be conducted using these simulation spaces.

Study limitations

The inclusion of a control group is suggested to increase the credibility of the findings by demonstrating that changes in the experimental group are not the result of chance. This can increase the scientific strength of the study, making the results easier to generalize and apply in other contexts.

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