Does Clinical Simulation Learning Enhance Evidence-Based Practice? A Quasi-Experimental Study Involving Nursing Students

César Leal-Costa[a] (cleal@um.es); José Jorge Carrasco-Guirao[a] (josejorge.carrasco@um.es); María Gracia Adánez-Martínez[b*] (g.adanez@um.es); Antonio Jesús Ramos-Morcillo[a] (ajramos@um.es); María Ruzafa-Martínez[a] (maruzafa@um.es); María Suarez-Cortes[a] (maria.suarez@um.es); Ismael Jiménez-Ruiz[a] (ismael.jimenez@um.es); Alonso Molina-Rodríguez[a] (alonso.molina@um.es); José Luis Díaz-Agea[a] (agea@um.es)

[a] Department of Medicine, Faculty of Nursing, University of Murcia, 30120, El Palmar, Murcia, Spain.

[b] Department of Medicine, Faculty of Medicine University of Murcia, 30120, El Palmar, Murcia, Spain.

* Corresponding author: María Gracia Adánez-Martínez. Faculty of Medicine, University of Murcia, 30120, El Palmar, Murcia, Spain. E-mail: g.adanez@um.es

Does Clinical Simulation Learning Enhance Evidence-Based Practice? A Quasi-Experimental Study Involving Nursing Students

Abstract

Aim: This study aimed to evaluate the impact of high-fidelity clinical simulation on evidence-based practice (EBP) competence in nursing students.

Background: Clinical simulation is an important educational tool in nursing, providing a safe learning environment and enhancing students' clinical and non-technical skills. Meanwhile, evidence-based practice is crucial in nursing as it involves utilizing the best available research to deliver high-quality care. A quasi-experimental study was conducted with a non-randomized intervention group of third-year Bachelor of Nursing students. Competence in EBP was compared before and after the implementation of high-fidelity clinical simulation training.

Design: A quasi-experimental study was conducted with a non-randomized intervention group of third-year Bachelor of Nursing students. Competence in EBP was compared before and after the implementation of high-fidelity simulation (HFS) training.

Methods: Questionnaires were utilized to collect sociodemographic and academic data, as well as assess students' competence in evidence-based practice. HFS sessions were conducted, comprising prebriefing, briefing, simulation, and structured debriefing. Competence in EBP was measured before and after the simulation sessions.

Results: The results demonstrated a significant improvement in EBP competence following HFS training. The students exhibited a statistically significant increase in their knowledge and skills related to EBP after the HFS intervention.

Conclusions: HFS is an effective strategy for enhancing evidence-based practice competence in nursing students. Integrating clinical simulation and evidence-based practice in nursing education can promote evidence-based practices and enhance the quality of patient care.

Keywords: Nursing; Evidence-based practice; Clinical Simulation; Quasi experimental study.

1. Introduction.

Clinical simulation in nursing is a process through which nursing students can replicate clinical practices in a safe environment (Eyikara & Baykara, 2017). Simulated environments are a fundamental component of nursing training as they bridge the gap between theoretical learning and clinical practice. The aim of simulation-based learning (SBL) is to achieve outcomes that closely resemble real practice (Koukourikos et al., 2021). SBL refers to a variety of activities that utilize patient simulators, including devices, trained individuals, etc. (Kim et al., 2016). Clinical simulations help nursing students develop different scenarios that require the use of both clinical and non-technical skills (decision-making, communication, teamwork, situational awareness, etc.) (Koukourikos et al., 2021). Nursing students participating in educational programs that include simulations make fewer errors in clinical settings and are able to enhance their critical thinking and decision-making skills (Kim et al., 2016).

Evidence-based practice (EBP) is a problem-solving approach that involves gathering, critically evaluating, and applying research findings to improve clinical practice and patient outcomes (Mackey & Bassendowski, 2017). EBP is the cornerstone of clinical practice and involves integrating the best available research, clinical expertise, and patient

preferences into clinical practice so that nurses can make informed decisions about patient care (Kerr & Rainey, 2021). EBP is an essential part of nursing practice that helps nurses provide high-quality care based on the most current research and knowledge available (Patelarou et al., 2020).

2. Background

Some advantages of using simulation in nursing education include ensuring effective learning, improving clinical reasoning abilities, providing a safe learning environment, mitigating errors, and enhancing teamwork and communication skills (Eyikara & Baykara, 2017; Franklin & Blodgett, 2020; Kim et al., 2016; Oliveira et al., 2018).

There are numerous simulation models. Zone-based simulation training (Roussin & Weinstock, 2017) allows gradual skill and knowledge training. Zones 0, 1, and 2 involve working with students or professionals who train in environments with increasing levels of distraction and fidelity, making it more realistic. However, starting from zone 2, teams can work in simulated environments that closely resemble their daily activities, as was the case in the research presented in this article. High-fidelity simulation (HFS) involves the use of sophisticated mannequins in realistic environments (Hanshaw & Dickerson, 2020).

HFS is divided into several stages: prebriefing, briefing, participation in the simulated scenario, and debriefing (Koukourikos et al., 2021). It is worth noting that there are standards for designing and conducting clinical simulations in nursing education. The International Nursing Association for Clinical Simulation and Learning (INACSL) has developed The Healthcare Simulation Standards of Best Practice™, which provide guidelines for designing, implementing, and evaluating clinical simulations (Watts, Rossler, et al., 2021).

During the prebriefing phase, students are introduced to the simulation objectives, scenario, equipment to be used, and a safe learning environment is ensured. The best scientific evidence is sought to develop clinical scenarios. This phase also includes a pre-briefing session, which is an opportunity for students to ask questions and clarify expectations (McDermott et al., 2021; Silva et al., 2022; Tong et al., 2022; Watts, McDermott, et al., 2021).

Participation in the simulated scenario involves real simulation experience. Students are expected to apply their knowledge and skills to manage the condition of the simulated patient. Lastly, debriefing involves reflecting on the simulation experience. Students are encouraged to discuss their performance, identify areas for improvement, and receive feedback from their peers and facilitators. Debriefing is an essential component of clinical simulation as it helps students consolidate their learning and transfer it to real-life situations (Alhaj Ali & Musallam, 2018; Decker et al., 2021).

As mentioned, during the prebriefing phase, it is ensured that simulation participants are prepared to engage in the simulated scenario. It is crucial to allow students time to formally identify expected outcomes and design an action plan (León-Castelao & Maestre, 2019). Criterion 4 of the Healthcare Simulation Standards of Best Practice™ states that participant preparation before the simulated experience is highly important, and preparation materials should be meticulously developed. These materials serve a crucial function in ensuring that students are fully prepared to engage in the experience and confidently address the scenario objectives (McDermott et al., 2021). In the case of this article, students prepared the material in advance of the simulated experience by seeking the best scientific evidence related to the learning objectives of the scenario.

PBE constitutes the process by which nurses seek, critically evaluate, and implement knowledge from multiple sources, including empirical evidence. The primary goal is to provide high-quality patient-centered care (Horntvedt et al., 2018).

Clinical simulation and PBE are related in nursing education. Simulation is an evidence-based learning methodology for teaching best nursing practices, and it can be used to learn evidence-based best practices related to the scenario's learning objectives (Cant et al., 2022). Additionally, simulation can be used as a tool to introduce and implement evidence-based practice guidelines in hospitals (Song & Jang, 2021).

In summary, simulation is an important tool in nursing education that can be used to teach theoretical and clinical concepts, enhance clinical and non-technical skills, and prepare students to apply nursing interventions in a clinical setting. It is also an evidence-based educational methodology that can be used to teach best nursing practices and apply evidence-based practice guidelines.

Our general objective is to evaluate competency in evidence-based practice among students in the Nursing Degree program before and after implementing HFS training.

The research question we aim to address is: Does clinical simulation improve competency in evidence-based practice among nursing students?

3. Method

3.1 Design

A quasi-experimental study was conducted with a non-randomized intervention group of third-year Nursing students who attended HFS sessions. Competency in evidence-based practice was compared before and after the intervention.

3.2 Participants

The target population consisted of third-year students in the Nursing Degree program who were enrolled in the Clinical Practices course in medical and surgical hospital units at the University XXX, XXX, during the 2021-2022 academic year.

A non-probabilistic sampling method was used because SCAF-based training was offered to all third-year students as an integrated part of the curriculum.

The inclusion criteria were as follows: 1) third-year Nursing students, 2) attendance of all HFS sessions, 3) correct completion of all questionnaires, and 4) signing the informed consent form. The exclusion criteria were: 1) completion of any formal training in Evidence-Based Practice and 2) completion of any HFS training.

3.3 Variables and Measurement Instrument

Different instruments were utilized to collect the variables of interest.

Different instruments were utilized to collect the variables of interest.

(a) Sociodemographic variables: age, gender; (b) Academic variables: university access, other higher education studies, previous training in PBE, and number of articles read in the last month; (c) Questionnaire of Competence in Evidence-Based Practice in nursing students (EBP-COQ) (Ruzafa-Martinez et al., 2013). A validated instrument in Spanish specifically developed to assess self-perceived competence in PBE among nursing students. It was used to evaluate changes in students' competency in PBE (knowledge, skills, and attitudes toward PBE).

3.4 Procedure and teaching program

During the 2021-2022 academic year, students were trained through clinical scenarios conducted with a high-fidelity simulator, acting as a patient in a hospital unit (medical or

surgical), in a room that simulated a real environment. The simulation program design followed the standards from the International Nursing Association of Clinical and Simulation Learning (INACSL) (Watts, McDermott, et al., 2021). The scenarios were performed by groups of 2-3 students, and the other students observed in real-time during the clinical simulation sessions.

Six clinical scenarios were designed, four based on internal medicine hospital units and two based on surgical hospital units (Table 1). All scenarios were designed following internationally accepted recommendations for scenario design (Watts, McDermott, et al., 2021), including the following stages: 1. Identification of training needs; 2. Definition of learning objectives; 3. Scenario agenda and planning; and 4. Selection of debriefing style.

The scenarios were designed for students to work through situations according to the Nursing Interventions Classification (NIC) (Dochterman et al., 2018).

-Insert Table 2-

Each simulation session was structured into prebriefing, briefing, simulation, and structured debriefing, following the INACSL guidelines (McDermott et al., 2021). Prebriefing was used to establish a psychologically safe learning environment. To achieve this, several group dynamics based on the practices proposed by Rudolph et al. (2014) and the INACSL best practice standards (Watts, McDermott, et al., 2021) were implemented (Table 2).

Before each simulated scenario, a briefing was conducted, presenting information about the scenario and addressing any potential questions. Subsequently, a simulated clinical scenario took place, with students assuming the role of nurses. Observer students took notes on the situation regarding strengths and weaknesses to facilitate analysis and reflection on the scenario.

Finally, a structured debriefing was conducted, following the GAS (Gather, Analyze, and Summarize) method (Cheng et al., 2014). In the Gather phase, participants reported their experiences and feelings during the scenario. The Analysis phase focused on reflecting on strengths and weaknesses during the performance of the clinical scenario. In the Summarize phase, a transfer of the learned skills from the simulated clinical scenario to real-life situations was performed. The debriefing followed the guidelines set by INACSL (Decker et al., 2021).

The competency of PBE (attitude, skills, and knowledge) and academic variables were measured at the beginning and end of the SCAF sessions (with a one-month gap between pre- and post-measurements).

3.6 Data Analysis

SPSS® v. 25 (Statistical Package for the Social Sciences) software was used to analyze the data. Statistical significance was set at a p-value <0.05.

A descriptive analysis of the study variables was conducted. For quantitative variables, mean and standard deviation were used, while frequencies and percentages were used for categorical variables.

The comparison of pre- and post-intervention scores was performed using the t-Student test with Bonferroni correction for multiple comparisons or the Chi-square test (replaced by Fisher's exact test for cells with $n < 5$ cases) for qualitative variables. Effect size was calculated for each variable using Cohen's d to assess the magnitude of the intervention's effect, using the values proposed by Cohen (Cohen, 2013), where 0.20 indicates a small effect, 0.50 a moderate effect, and 0.80 a large effect.

3.7 Ethical considerations

The study was conducted in accordance with the principles of the Declaration of Helsinki (World Medical Association, 2013). The administrators/teachers responsible for the nursing students were informed that participation in the study would be completely voluntary. Students were informed about the non-harmful treatment of those who refused to participate or withdrew from the study after accepting to participate. Informed consent was obtained from all participants, and questionnaires were identified using numeric codes to ensure confidentiality. No identifying information was collected from participants, thus always ensuring their anonymity. The study received approval from the Ethics Committee of the University of XXX (CEI) (Code 3762).

4. Results

4.1 Sociodemographic and Academic Characteristics

Once the inclusion/exclusion criteria were applied to the entire sample population (n=191), the final sample consisted of 182 third-year nursing students (95.29% response rate), with a mean age of 23.02 (SD=7.62) years, of which 81.9% (n=149) were women. The majority of students had entered the Nursing Degree program after completing secondary education (80.2%, n=142), or technical and vocational education programs (9.9%, n=18). 80.8% (n=147) had no other university studies, and 91.8% (n=167) had not received any training in PBE.

4.2 Effect of the HFS Teaching Program on EBP Competence

During the analysis of items in the EBP-COQ questionnaire's attitude dimension, it was found that the participants' mean total score for each item was similar before and after the training, except for items 10 and 11, where statistically significant differences were observed with low effect sizes (0.20 and 0.26, respectively). Regarding the skill

dimension, it was observed that the participants' mean score for each item was higher after the training, with statistically significant differences in all items and small effect sizes (0.25-0.40). Finally, in the knowledge dimension, it was observed that the participants' mean total score for each item was higher after the training, with statistically significant differences in all items and effect sizes ranging from low to moderate (0.38-0.65), as presented in Table 3.

-Insert Table 3-

Table 4 displays the scores obtained in the attitude, skill, and knowledge dimensions of the EBP-COQ questionnaire. After the training program, a statistically significant improvement was recorded in the scores of all dimensions, except for the attitude dimension ($p < 0.05$). The effect size obtained in the skill and knowledge dimensions was moderate (0.48 and 0.77, respectively).

-Insert Table 4-

Finally, a statistically significant association was found in the variable of the number of scientific articles read in the last month ($\chi^2 = 121.78$, $p < 0.001$), where students read more articles after the implementation of the high-fidelity clinical simulation-based training program (pre n=11 and post n=111 students read >3 articles).

5. Discussion

Through this study, we aimed to evaluate the impact of simulation-based learning on nursing students' perception of their competencies in evidence-based practice (EBP). The main findings of this work confirm the importance of clinical simulation, not only for training skills and acquiring knowledge but also for enabling students to develop a better self-perceived EBP.

The benefits of simulation as a training method extend beyond learning itself. Additionally, it puts students in a position that allows them to develop critical thinking skills (Arizo-Luque et al., 2022) and prepares them to face real healthcare situations with the best tools, such as EBP.

Several studies (Hume et al., 2021; Jordan et al., 2019; McKenna, 2020; Sarawad, 2023) have shown that EBP improves healthcare delivery and is one of the best tools for applying scientifically and ethically grounded care in various nursing practice areas. With our study, we wanted to investigate how simulation can contribute to raising students' awareness of the rational use of evidence-based care.

Many students learn in an uncritical manner by observing what they see in hospitals through observational learning processes (Rumjaun & Narod, 2020), which tends to replicate behaviours based on social imitation models. Acquiring EBP competencies would help question this imitation model in care learning and complement it with the use of the best available evidence for daily clinical practice.

The dimensions of the EBP questionnaire, which were used to answer the initial research question, included attitudes, skills, and knowledge related to self-perceived competence in EBP. In this study, we found a significant increase in skill and knowledge dimensions concerning these competencies compared to the pre-test. In the attitude dimension, there was an increase, but it was not statistically significant. This may be because the students' baseline attitudes toward EBP were already positive, and simulation did not substantially modify them. Attitudes toward EBP depend on various factors, including previous experience in nursing research (Tomotaki et al., 2020). t is likely that students, even without such research experience, were aware that EBP is the best possible tool for planning and delivering care. In Items 10 and 11 of the questionnaire (attitude dimension),

there was a significant increase in scores. These items are related to the practical application of EBP and its direct impact on patients' health.

Regarding the skills dimension, students felt better prepared to address the challenges of searching for the best available evidence after undergoing simulation, formulating research questions, or critically evaluating an article. Simulation provides an ideal environment for training these EBP skills because, starting from the pre-briefing stage, students must search for evidence related to the scenarios they will encounter, and the learning objectives chosen for each case. The importance of prior theoretical preparation for simulation has been emphasized (Dileone et al., 2020; Tong et al., 2022), equipping students with the best tools to tackle the simulated experience. Such preparation involves evidence search and training in EBP skills.

Students scored higher in the knowledge dimension of the EBP questionnaire after their simulation training. This increase was significant in all items (research question formulation, knowledge of research designs, etc.), resulting in an overall improved perception of their EBP knowledge compared to before the simulations. Knowledge about the recommendation grades and levels of evidence in the articles consulted to prepare for the simulation also increased. Creating a culture of EBP among nursing students is important since, in general, they are not usually highly motivated or committed to EBP (Patelarou et al., 2020). We believe that simulation can function as a motivating connection for students to find the handling of scientific evidence with a practical purpose attractive, as simulation itself is a motivating element for students if well conducted (Díaz-Agea et al., 2021).

5.1. Limitations

There was no control group, and the study was conducted in a local setting. Therefore, the external validity of the study may not be adequate. It would be necessary to carry out an experimental design with a control group and multicentre approach.

The moderate-low effect size of the results in this study could have implications for their interpretation, indicating that further studies with a larger number of participants are needed to statistically corroborate the initial findings regarding the impact of simulation on increasing students' competencies in Evidence-Based Practice (EBP).

6. Conclusion

Clinical simulation is a pedagogical tool that not only contributes to enhancing students' clinical or non-technical competencies but can also improve their perception of the use of Evidence-Based Practice.

Clinical simulation enhances competencies in EBP among nursing students, particularly in the dimensions of skills and knowledge.

3. References

Alhaj Ali, A., & Musallam, E. (2018). Debriefing Quality Evaluation in Nursing Simulation-Based Education: An Integrative Review. *Clinical Simulation in Nursing*, *16*, 15–24. https://doi.org/10.1016/j.ecns.2017.09.009

Arizo-Luque, V., Ramirez-Baena, L., Pujalte-Jesús, M. J., Rodríguez-Herrera, M. Á., Lozano-Molina, A., Arrogante, O., & Díaz-Agea, J. L. (2022). Does Self-Directed Learning with Simulation Improve Critical Thinking and Motivation of Nursing Students? A Pre-Post Intervention Study with the MAES© Methodology. *Healthcare*, *10*(5), Article 5. https://doi.org/10.3390/healthcare10050927

Cant, R., Cooper, S., & Ryan, C. (2022). Using virtual simulation to teach evidence-based practice in nursing curricula: A rapid review. *Worldviews on Evidence-Based Nursing*, *19*(5), 415–422. https://doi.org/10.1111/wvn.12572

Cheng, A., Eppich, W., Grant, V., Sherbino, J., Zendejas, B., & Cook, D. A. (2014). Debriefing for technology-enhanced simulation: A systematic review and meta-analysis. *Medical Education*, *48*(7), 657–666. https://doi.org/10.1111/medu.12432

Cohen, J. (2013). *Statistical Power Analysis for the Behavioral Sciences* (Second). Taylor & Francis.

Decker, S., Alinier, G., Crawford, S. B., Gordon, R. M., Jenkins, D., & Wilson, C. (2021). Healthcare Simulation Standards of Best PracticeTM The Debriefing Process. *Clinical Simulation In Nursing*, *58*, 27–32. https://doi.org/10.1016/j.ecns.2021.08.011

Díaz-Agea, J. L., Pujalte-Jesús, M. J., Leal-Costa, C., García-Méndez, J. A., Adánez-Martínez, M. G., & Jiménez-Rodríguez, D. (2021). Motivation: Bringing up the rear in nursing education. Motivational elements in simulation. The participants' perspective. *Nurse Education Today*, *103*, 104925. https://doi.org/10.1016/j.nedt.2021.104925

Dileone, C., Chyun, D., Diaz, D. A., & Maruca, A. T. (2020). An Examination of Simulation Prebriefing in Nursing Education: An Integrative Review. *Nursing Education Perspectives*, *41*(6), 345–348. https://doi.org/10.1097/01.NEP.0000000000000689

Dochterman, J. M., Wagner, C. M., Butcher, H. K., & Bulechek, G. M. (2018). *Nursing Interventions Classification (NIC)—E-Book*. Elsevier Health Sciences.

Eyikara, E., & Baykara, Z. G. (2017). The Importance of Simulation in Nursing Education. *World Journal on Educational Technology: Current Issues*, *9*(1), 2–7.

Franklin, A. E., & Blodgett, N. P. (2020). Simulation in Undergraduate Education. *Annual Review of Nursing Research*, *39*(1), 3–31. https://doi.org/10.1891/0739-6686.39.3

Hanshaw, S. L., & Dickerson, S. S. (2020). High fidelity simulation evaluation studies in nursing education: A review of the literature. *Nurse Education in Practice*, *46*, 102818. https://doi.org/10.1016/j.nepr.2020.102818

Horntvedt, M.-E. T., Nordsteien, A., Fermann, T., & Severinsson, E. (2018). Strategies for teaching evidence-based practice in nursing education: A thematic literature review. *BMC Medical Education*, *18*(1), 172. https://doi.org/10.1186/s12909-018-1278-z

Hume, K., Steinbrenner, J. R., Odom, S. L., Morin, K. L., Nowell, S. W., Tomaszewski, B., Szendrey, S., McIntyre, N. S., Yücesoy-Özkan, S., & Savage, M. N. (2021). Evidence-Based Practices for Children, Youth, and Young Adults with Autism: Third Generation Review. *Journal of Autism and Developmental Disorders*, *51*(11), 4013–4032. https://doi.org/10.1007/s10803-020-04844-2

Jordan, Z., Lockwood, C., Munn, Z., & Aromataris, E. (2019). The updated Joanna Briggs Institute Model of Evidence-Based Healthcare. *International Journal of Evidence-Based Healthcare*, *17*(1), 58–71. https://doi.org/10.1097/XEB.0000000000000155

Kerr, H., & Rainey, D. (2021). Addressing the current challenges of adopting evidence-based practice in nursing. *British Journal of Nursing (Mark Allen Publishing)*, *30*(16), 970–974. https://doi.org/10.12968/bjon.2021.30.16.970

Kim, J., Park, J.-H., & Shin, S. (2016). Effectiveness of simulation-based nursing education depending on fidelity: A meta-analysis. *BMC Medical Education*, *16*, 152. https://doi.org/10.1186/s12909-016-0672-7

Koukourikos, K., Tsaloglidou, A., Kourkouta, L., Papathanasiou, I. V., Iliadis, C., Fratzana, A., & Panagiotou, A. (2021). Simulation in Clinical Nursing Education. *Acta Informatica Medica*, *29*(1), 15–20. https://doi.org/10.5455/aim.2021.29.15-20

León-Castelao, E., & Maestre, J. M. (2019). Prebriefing en simulación clínica: Análisis del concepto y terminología en castellano. *Educación Médica*, *20*(4), 238–248. https://doi.org/10.1016/j.edumed.2018.12.011

Mackey, A., & Bassendowski, S. (2017). The History of Evidence-Based Practice in Nursing Education and Practice. *Journal of Professional Nursing: Official Journal of the American Association of Colleges of Nursing*, *33*(1), 51–55. https://doi.org/10.1016/j.profnurs.2016.05.009

McDermott, D. S., Ludlow, J., Horsley, E., & Meakim, C. (2021). Healthcare Simulation Standards of Best PracticeTM Prebriefing: Preparation and Briefing. *Clinical Simulation In Nursing*, *58*, 9–13. https://doi.org/10.1016/j.ecns.2021.08.008

McKenna, H. (2020). Covid-19: Ethical issues for nurses. *International Journal of Nursing Studies*, *110*, 103673. https://doi.org/10.1016/j.ijnurstu.2020.103673

Oliveira, S. N. de, Massaroli, A., Martini, J. G., & Rodrigues, J. (2018). From theory to practice, operating the clinical simulation in Nursing teaching. *Revista Brasileira De Enfermagem*, *71*(suppl 4), 1791–1798. https://doi.org/10.1590/0034-7167-2017-0180

Patelarou, A. E., Mechili, E. A., Ruzafa-Martinez, M., Dolezel, J., Gotlib, J., Skela-Savič, B., Ramos-Morcillo, A. J., Finotto, S., Jarosova, D., Smodiš, M., Mecugni, D.,

Panczyk, M., & Patelarou, E. (2020). Educational Interventions for Teaching Evidence-Based Practice to Undergraduate Nursing Students: A Scoping Review. *International Journal of Environmental Research and Public Health*, *17*(17), 6351. https://doi.org/10.3390/ijerph17176351

Roussin, C. J., & Weinstock, P. (2017). SimZones: An Organizational Innovation for Simulation Programs and Centers. *Academic Medicine: Journal of the Association of American Medical Colleges*, *92*(8), 1114–1120. https://doi.org/10.1097/ACM.0000000000001746

Rudolph, J. W., Raemer, D. B., & Simon, R. (2014). Establishing a Safe Container for Learning in Simulation: The Role of the Presimulation Briefing. *Simulation in Healthcare*, *9*(6), 339–349. https://doi.org/10.1097/SIH.0000000000000047

Rumjaun, A., & Narod, F. (2020). Social Learning Theory—Albert Bandura. In B. Akpan & T. J. Kennedy (Eds.), *Science Education in Theory and Practice: An Introductory Guide to Learning Theory* (pp. 85–99). Springer International Publishing. https://doi.org/10.1007/978-3-030-43620-9_7

Ruzafa-Martinez, M., Lopez-Iborra, L., Moreno-Casbas, T., & Madrigal-Torres, M. (2013). Development and validation of the competence in evidence based practice questionnaire (EBP-COQ) among nursing students. *BMC Medical Education*, *13*(1). Scopus. https://doi.org/10.1186/1472-6920-13-19

Sarawad, S. S. (2023). Evidence-Based Practice in Nursing—A Review. *International Journal of Nursing Education and Research*, *11*(1), 82–84. https://doi.org/10.52711/2454-2660.2023.00018

Silva, C. C. da, Natarelli, T. R. P., Domingues, A. N., Fonseca, L. M. M., & Melo, L. de L. (2022). Prebriefing in clinical simulation in nursing: Scoping review. *Revista*

Gaucha De Enfermagem, *43*(spe), e20220067. https://doi.org/10.1590/1983-1447.2018.20220067.en

Song, C. E., & Jang, A. (2021). Simulation design for improvement of undergraduate nursing students' experience of evidence-based practice: A scoping-review protocol. *PLOS ONE*, *16*(11), e0260238. https://doi.org/10.1371/journal.pone.0260238

Tomotaki, A., Fukahori, H., & Sakai, I. (2020). Exploring sociodemographic factors related to practice, attitude, knowledge, and skills concerning evidence-based practice in clinical nursing. *Japan Journal of Nursing Science*, *17*(1), e12260. https://doi.org/10.1111/jjns.12260

Tong, L. K., Li, Y. Y., Au, M. L., Wang, S. C., & Ng, W. I. (2022). Prebriefing for high-fidelity simulation in nursing education: A meta-analysis. *Nurse Education Today*, *119*, 105609. https://doi.org/10.1016/j.nedt.2022.105609

Watts, P. I., McDermott, D. S., Alinier, G., Charnetski, M., Ludlow, J., Horsley, E., Meakim, C., & Nawathe, P. A. (2021). Healthcare Simulation Standards of Best PracticeTM Simulation Design. *Clinical Simulation In Nursing*, *58*, 14–21. https://doi.org/10.1016/j.ecns.2021.08.009

Watts, P. I., Rossler, K., Bowler, F., Miller, C., Charnetski, M., Decker, S., Molloy, M. A., Persico, L., McMahon, E., McDermott, D., & Hallmark, B. (2021). Onward and Upward: Introducing the Healthcare Simulation Standards of Best PracticeTM. *Clinical Simulation In Nursing*, *58*, 1–4. https://doi.org/10.1016/j.ecns.2021.08.006

World Medical Association. (2013). World Medical Association Declaration of Helsinki: Ethical principles for medical research involving human subjects. *JAMA*, *310*(20), 2191–2194. https://doi.org/10.1001/jama.2013.281053

Table 2. Scenarios in which students learned through high-fidelity simulation.

Simulated Clinical Scenario	NIC Interventions
A patient presenting with symptoms of dyspnea, increased expectoration, and fever (38.5 ºC) was admitted from the emergency department. The patient self-reports difficulty in breathing. The diagnosis is pneumonia.	- Vital signs monitoring (6680) - Medication administration (2300) - Oxygen therapy (3320) - Phlebotomy: arterial blood sample (4232)
The patient was admitted to the Cardiology department for the management of Non-ST Elevation Acute Coronary Syndrome (NSTEACS). Currently, the patient is in the ward awaiting a coronary angiography procedure. The patient's family reports the presence of thoracic pain and nausea while at rest.	- Cardiac care: acute (4044) - Vital signs monitoring (6680) - Phlebotomy: venous blood sample (4238)
The patient was admitted to the cardiology unit following an episode of acute coronary syndrome without ST elevation. It is noteworthy that he had been previously hospitalized in the intensive care unit (ICU) ten days ago, during which he underwent therapeutic catheterization resulting in the placement of two stents in the right coronary artery. It is important to mention that the patient's wife, who is present with him, has expressed concern about her husband's unresponsiveness. Discharge from the hospital is anticipated for tomorrow.	- Resuscitation (6320) - Defibrillator Management: External (4095) - Medication Administration: Intravenous (IV) (2314)
The patient was admitted to the Internal Medicine unit following a decompensation of Type I diabetes caused by endocrinological factors. Five days ago, the patient experienced diabetic ketoacidosis, which was treated in the Intensive Care Unit (ICU) where he was initially admitted. The patient also presents with hypertension. Accompanying the patient is his daughter, who informs us that her father believes he is experiencing symptoms of hyperglycemia.	- Hyperglycemia Management (2120) - Liquids/electrolytes management (2080) - Medication Administration: Intravenous (IV) (2314)
A patient was diagnosed with acute pancreatitis accompanied by choledocholithiasis. Following cholecystectomy surgery, the patient has a left Penrose drain placed in the pouch of Douglas and a Jackson-Pratt drain in the pancreatic region. The patient is experiencing significant pain and nausea.	- Nausea management (1450) - Pain management (1400) - Tube care (1870)
The patient has been scheduled as the third case on the traumatology surgery list for receiving a prosthetic hip due to an accidental fall. She exhibits feelings of discouragement, insecurity, fear, and stress, primarily concerning her hygiene and doubts about her ability to walk again.	- Teaching: preoperative (5610). - Surgical preparation (2930).
Prior to entering the operating room, it is necessary to administer concentrated red blood cells to the patient. This intervention is prompted by the results of emergency analytical tests, which revealed low hematocrit levels and red blood cell values.	- Blood products administration(4030)

Table 2. Dynamics for ensuring a psychologically safe learning environment.

• Detailed explanation of session development. • Clarification of expectations and addressing concerns raised regarding the session's simulation procedure. • Explanation of logistical details regarding the clinical simulation laboratory, simulator, and tools used. • Explanation that errors are opportunities for learning (errors carry no risk or consequences). • Establishment of a "fictional contract" with participants. • Agreement of confidentiality and commitment to respect other participants. • Active search for scientific evidence supporting the resolution of the clinical scenario.

Table 3. Scores obtained in the items from the questionnaire pre and post-training.

Items	Pre-training	Post-training	Pre-Post training					
	M (SD)	*M (SD)*	*M*	*95% CI*		*t*	*p*	*d*
Attitude								
A1 The EBP helps to make decisions in clinical practice	4.77 (0.49)	4.72 (0.63)	-0.05	-0.16	0.05	-1.04	0.30	-
A2 I'm confident that I will be able to evaluate critically the quality of a scientific article	3.90 (0.75)	3.83 (0.87)	-0.07	-0.22	0.09	-0.84	0.40	-
A3 The practice of EBP will help to have a better definition of the nurse roll	4.65 (0.58)	4.63 (0.59)	-0.02	-0.12	0.08	-0.44	0.66	-
A4 The nursing contract should include time to read scientific papers and make critical appraisal of them.	4.26 (0.76)	4.34 (0.77)	0.08	-0.04	0.20	1.27	0.21	-
A5 The widespread EBP implementation will allow to increase nursing autonomy from others professions.	4.53 (0.68)	4.60 (0.63)	0.07	-0.05	0.19	1.15	0.25	-
A6 When I work as a nurse I will pleased if the PBE will be in practice	4.63 (0.60)	4.59 (0.58)	-0.04	-0.14	0.06	-0.74	0.46	-
A7 The application of EBP improves patient's healthcare outcomes	4.73 (0.56)	4.69 (0.58)	-0.03	-0.13	0.07	-0.66	0.51	-
A8 In the future I wish to contribute to apply the EBP	4.19 (0.79)	4.16 (0.83)	-0.03	-0.16	0.09	-0.53	0.60	-
A9 I do not like reading scientific articles	4.01 (0.74)	3.96 (0.85)	-0.05	-0.17	0.06	-0.91	0.36	-
A10 The patient care will experiment minor changes with the EBP application	4.11 (0.90)	4.29 (0.65)	-0.18	-0.31	-0.05	-2.75	0.01	0.20
A11 It pleased me that the EBP is only a theoretical movement that does not takes in practice	4.35 (0.80)	4.55 (0.59)	-0.20	-0.32	-0.09	-3.53	0.00	0.26
A12 If I will have the opportunity I would assist to an EBP course	4.12 (0.74)	4.10 (0.83)	-0.01	-0.13	0.11	-0.17	0.86	-
A13 I would like to have better access to published nursing scientific evidences	4.53 (0.56)	4.52 (0.64)	-0.01	-0.10	0.08	-0.25	0.81	-
Skills								
S1 I feel able to make a clinical question to start the searching of the best scientific evidence.	2.91 (0.99)	3.24 (1.01)	0.330	0.168	0.492	4.014	<0.001	0.30
S2 I do not feel able to search for scientific evidences in the principles heath sciences data bases.	2.76 (1.08)	3.19 (1.00)	0.434	0.265	0.603	5.057	<0.001	0.37
S3 I do not feel able to search for the scientific information about the subject in the most important bibliographic indexes.	2.95 (1.02)	3.32 (0.95)	0.374	0.202	0.546	4.284	<0.001	0.32
S4 I feel able to evaluate critically the quality of a scientific article.	2.65 (0.93)	3.07 (0.97)	0.412	0.263	0.561	5.454	<0.001	0.40
S5 I do not feel able to analyze if the obtained results of a scientific study are valid.	2.70 (0.99)	2.99 (0.96)	0.286	0.115	0.456	3.312	0.001	0.25
S6 I feel able to analyze the practical utility of a scientific study.	3.19 (0.93)	3.48 (0.88)	0.297	0.138	0.456	3.681	<0.001	0.27
Knowledge								
K1 I know how to make clinical questions structured in the PICO format.	2.60 (1.01)	3.10 (1.06)	0.505	0.357	0.654	6.700	<0.001	0.50
K2 I know the principal sources that offer the information revised and catalogued behind the evidence point of view.	2.71 (1.18)	3.46 (1.07)	0.747	0.580	0.914	8.822	<0.001	0.65
K3 I do not know the most important characteristics of the principal investigation designs.	2.41 (0.93)	2.95 (0.97)	0.544	0.372	0.716	6.230	<0.001	0.46
K4 I know the different evidence level of the designs of the investigation studies.	2.75 (1.00)	3.14 (1.00)	0.390	0.239	0.541	5.093	<0.001	0.38
K5 I do not know the different recommendation grades about the adoption of a determined procedure or health intervention.	2.66 (0.96)	3.12 (1.02)	0.456	0.289	0.623	5.375	<0.001	0.40
K6 I know the principal measures of association and potential impact that allow to evaluate the magnitude of the analyzed effect in investigation studies	2.46 (1.01)	2.89 (1.05)	0.434	0.280	0.588	5.561	<0.001	0.41

M = man; *SD* = standard deviation; *CI*= Confidence interval; *d* = Cohen's effect size

Table 4. Pre- and post-training scores obtained in the questionnaire for the dimensions of knowledge, skills, and attitudes

Dimensions	Pre-training	Post-training	Pre-Post training					
	M (SD)	*M (SD)*	*M*	*95% CI*		*t*	*p*	*d*
Attitudes	57.16 (4.98)	56.60 (5.48)	-0.56	-1.30	0.18	-1.50	0.135	
Skills	17.16 (4.52)	19.29 (4.40)	2.13	1.48	2.79	6.42	<0.001	0.48
Knowledge	15.59 (4.23)	18.66 (4.57)	3.08	2.49	3.66	10.34	<0.001	0.77

M = man; *SD* = standard deviation; *CI*= Confidence interval; *d* = Cohen's effect size