

HEALTHCARE SIMULATION IN NURSING EDUCATION: SATISFACTION, SELF-CONFIDENCE, AND KNOWLEDGE ABOUT DIABETES MELLITUS SCREENING

Simulação em saúde na formação em enfermagem: satisfação, autoconfiança e conhecimento sobre rastreamento do diabetes mellitus

Simulación en salud en la formación de enfermería: satisfacción, autoconfianza y conocimiento sobre el tamizaje de la diabetes mellitus

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ABSTRACT

The aim of the study was to evaluate students' satisfaction, self-confidence, and knowledge retention after a Health Simulation on Diabetes Mellitus screening in Primary Health Care. This quantitative, quasi-experimental pre- and post-test study was conducted with nursing students at a public university in the Federal District, Brazil. Initially, 46 students participated, 15 in the experimental group and 31 in the control group; 33 completed the knowledge retention assessment. Satisfaction and self-confidence were assessed in the experimental group after the simulation. Satisfaction (4.92 ± 0.27) and self-confidence (4.83 ± 0.79) scores were high. Knowledge scores increased in the experimental (8.72 ± 1.49 to 9.70 ± 0.48) and control groups (8.29 ± 1.34 to 9.30 ± 1.01). The results suggest that the intervention may be a promising teaching strategy in this context. However, inferential analyses are needed to assess between-group differences and determine whether observed changes may be attributed to the intervention.

Keywords: Simulation training. Students, nursing. Primary health care.

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RESUMO

Objetivou-se avaliar a satisfação, autoconfiança e retenção de conhecimento de estudantes após uma Simulação em Saúde sobre rastreamento do Diabetes Mellitus na Atenção Primária. Trata-se de estudo quase-experimental, quantitativo, tipo pré e pós-teste, realizado com estudantes de enfermagem de uma universidade pública no Distrito Federal. Inicialmente, 46 estudantes participaram, 15 no grupo experimental e 31 no controle; 33 completaram a avaliação de retenção de conhecimento. A satisfação e autoconfiança foram avaliadas no grupo experimental após a simulação. Os escores de satisfação ($4,92 \pm 0,27$) e autoconfiança ($4,83 \pm 0,79$) foram elevados. Houve aumento dos escores de conhecimento nos grupos experimental ($8,72 \pm 1,49$ e $9,70 \pm 0,48$) e controle ($8,29 \pm 1,34$ e $9,30 \pm 1,01$). Os resultados sugerem potencial da intervenção como estratégia de ensino nesse contexto. Entretanto, análises inferenciais são necessárias para verificar diferenças entre os grupos e atribuir possíveis efeitos à intervenção.

Palavras-chave: Treinamento por simulação. Estudantes de enfermagem. Atenção Primária à Saúde.

RESUMEN

Se objetivó evaluar la satisfacción, autoconfianza y retención de conocimiento de estudiantes tras una Simulación en Salud sobre la detección de Diabetes Mellitus en la Atención Primaria. Estudio cuasiexperimental, cuantitativo, pre y posttest, realizado con estudiantes de enfermería de una universidad pública del Distrito Federal. Inicialmente participaron 46 estudiantes, 15 en el grupo experimental y 31 en el control; 33 completaron la evaluación de retención de conocimiento. La satisfacción y autoconfianza se evaluaron en el grupo experimental tras la simulación, con puntajes elevados: satisfacción ($4,92 \pm 0,27$) y autoconfianza ($4,83 \pm 0,79$). Hubo aumento de los puntajes de conocimiento en ambos grupos: experimental ($8,72 \pm 1,49$; $9,70 \pm 0,48$) y control ($8,29 \pm 1,34$; $9,30 \pm 1,01$). Los resultados sugieren el potencial de la intervención como estrategia de enseñanza en este contexto. Pero, son necesarios análisis inferenciales para verificar diferencias entre los grupos y atribuir posibles efectos a la intervención.

Palabras clave: Entrenamiento simulado. Estudiantes de enfermería. Atención primaria de salud.

INTRODUCTION

Healthcare simulation (HS) is a modern, active teaching methodology that enables students to practice their technical and cognitive skills through the construction of controlled and safe scenarios that simulate real-life clinical situations¹. The Healthcare simulation (HS) occurs in three stages: briefing, with presentation of objectives, rules, and functions; scenario, in which students experience the clinical situation with the support of facilitators; and debriefing, a time for discussion and critical reflection on decisions, results, successes, errors, and lessons learned from the activity².

This methodology enables the student to relate theoretical knowledge to clinical practice, decision-making, and promotes safety, with the teacher acting as a facilitator of the learning process. Furthermore, previous studies have shown that HS promotes the development and/or strengthening of cognitive skills important for professional training^{3,4}, such as self-confidence and student satisfaction with learning^{3,5-6}.

Satisfaction is defined as a feeling of pleasure or contentment in relation to expectations after the outcome of an event, and self-confidence as an individual's conviction about their personal competence in achieving their own goals. In this learning context, such feelings can be parameters for evaluating the quality of teaching⁷⁻⁸.

To measure such HS outcomes, the National League for Nursing (2006) proposed the Student Satisfaction and Self-Confidence in Learning scale, which was translated and validated into Portuguese, named Escala de Satisfação de Estudantes e Autoconfiança na Aprendizagem (ESEAA), which means: Student Satisfaction and Self-Confidence in Learning Scale⁷. Using ESEAA, previous studies have shown that students who were exposed to HS obtained positive results in terms of satisfaction and self-confidence, as well as an increase in self-confidence compared to the use of the traditional teaching method. The positive impact reduced anxiety,

improved the formulation of critical thinking and clinical reasoning, and in some cases, students felt more satisfied than self-confident^{3,5-6}.

By providing students with contact with an environment that connects clinical situations to real-life situations encountered in clinical practice, HS requires learners to articulate prior knowledge with the necessary clinical reasoning, thus favoring a broader understanding of the presented situation and knowledge retention through the meaning constructed during the integration of this knowledge. As postulated by Ausubel's theory of meaningful learning, which describes it as a form of learning in which new content is integrated into the student's cognitive framework through connections with prior knowledge, creating logical relationships and allowing the internalization of this new knowledge⁹⁻¹⁰.

Given the facts presented, the impact that HS can have on students' knowledge, satisfaction, and self-confidence is notable. Therefore, it is of utmost importance to evaluate its repercussions in order to have a basis for formulating new teaching practices, based on this, that aim to stimulate cognitive skills, minimize stress, and train a prepared caregiving staff¹⁰.

In this sense, this study integrates a macro-project for the development of competencies for professional and collaborative practice that includes the development, validation, and application of health simulation scenarios focused on the care of people with diabetes mellitus (DM) in primary health care (PHC). Among the scenarios developed is the "Health Simulation for Diabetes Mellitus Screening in Primary Health Care," in which nursing students are expected to be able to recognize risk factors for DM, record objective and subjective data, make referrals and provide guidance, and develop the necessary clinical reasoning¹¹.

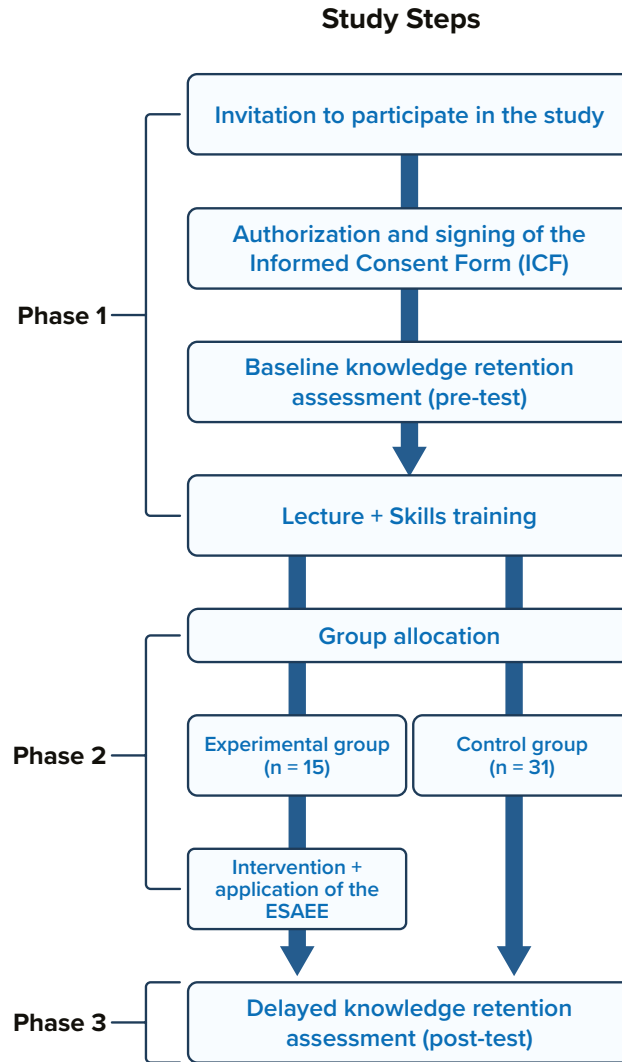
Therefore, the present study aims to measure the satisfaction, self-confidence, and knowledge retention of nursing students based on the application of a HS on diabetes mellitus screening in primary health care.

METHODS

This is a quasi-experimental study with a quantitative pre- and post-test approach using a convenience sample, which integrates the stage of evaluating satisfaction, self-confidence, and knowledge retention through the replication of a previously validated and applied scenario¹². This stage was conducted in three phases: (1) analysis of prior knowledge retention, followed by a lecture and skills training; (2) intervention through the replication of the DM screening scenario in primary health care, followed by the evaluation of satisfaction and self-confidence; and (3) analysis of delayed knowledge retention (Figure 1). The study was conducted at a public higher education institution in Brasília, DF, Brazil, from April to May 2025.

To implement the intervention, the researchers contacted the course instructors to present the research and the validated scenario. With their consent, the HS was included as part of the mandatory activities foreseen in the learning program, with three classes reserved for carrying out the activities with the students who agreed to participate in the study, described below as three meetings. These classes preceded the students' insertion into the practice fields and, prior to the study proposal, were intended for dispersion to review practices.

Figure 1 - Flowchart of the methodological steps of the study. Brasília, DF, Brazil, 2025.

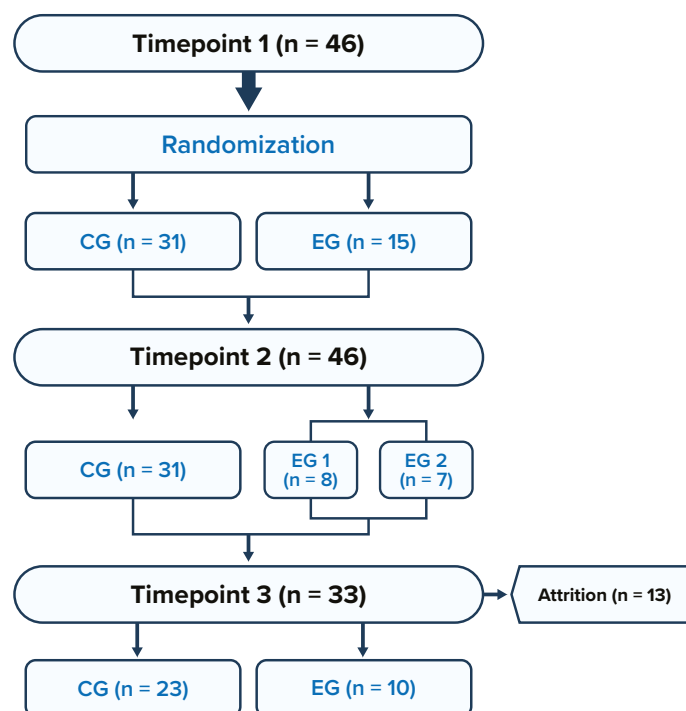


Study participants

The participants were approached through the professors of the discipline in which the scenario was applied. During the first meeting, the researchers presented the research project and the three objectives/axes of the study and the HS, in addition to the schedule of planned activities. After that, an invitation to participate in the research was extended, subject to authorization and signing of the Informed Consent Form (ICF). Following this, in an expository-dialogical class based on a clinical case and conducted by the researchers, three axes related to DM were addressed: Guidance on insulin therapy for users with type 2 DM in the context of nursing consultations in primary health care; Nursing consultations for individuals with foot ulcers related to DM; and DM screening in primary health care. The theoretical framework for the material was based on chapter 2 of the "Primary Care Book No. 36" from the Ministry of Health and the Guidelines of the Brazilian Diabetes Society¹³⁻¹⁴.

The population initially consisted of 46 fifth-semester nursing students from the aforementioned university, enrolled in a course focused on Adult and Elderly Care, after obtaining authorization and signing the Informed Consent Form. Their selection was justified by the relationship between the themes addressed in the course and the HS scenarios proposed in the macro-project. To participate in the proposed scenario, the 46 students were instructed to divide themselves into three equal groups and introduce themselves to the researchers. After this, a draw with numbers 1 to 3 was conducted by one of the researchers, in which 15 participants represented the experimental group (EG) of this study. The other two groups, totaling 31 participants, participated in the other two HS scenarios, thus being defined as the control group (CG) of this study.

Figure 2 - Flowchart of the selection of research participants. Brasília, DF, Brazil, 2025.



Data collection and analysis

Before and after the lecture-dialogue session, all participants (n=46) were given an instrument containing sociodemographic characterization (sex and age) and an assessment of prior knowledge retention (pre-test). In the second meeting, practical skills training was conducted on the topics covered in the previous week, such as anamnesis, physical examination, and nursing consultation.

In the following week and final meeting, the experimental group (EG) received the intervention and application of the Satisfaction and Self-Confidence in Learning assessment instrument, while, at the same time, the control group (CG) was allocated to other learning HS activities related to the two other themes mentioned above. Thirty days later, both groups completed the delayed knowledge retention assessment (post-test), allowing for a comparison of the results between the groups and the measurement of the intervention's effects over time.

To measure student satisfaction and self-confidence, the ESEAA was used¹¹. The instrument is organized as a self-assessment questionnaire composed of 13 items of the 5-point *Likert scale*, where Satisfaction corresponds to items 1 to 5 and Self-confidence in learning to items 6 to 13, where 1 = "strongly disagree with the statement", 2 = "disagree with the statement", 3 = "neither agree nor disagree with the statement", 4 = "agree with the statement" and 5 = "strongly agree". The results were calculated according to the average score of each item and the total average of the satisfaction and self-confidence subscales. The closer the average of the items and subscales is to 5, the greater the students' satisfaction and self-confidence in learning.

The knowledge retention assessment (pre- and post-test) consisted of administering a structured questionnaire with ten multiple-choice questions (alternatives A to D), each worth 1 point, with a maximum score of 10 points. The questions were developed in light of the theoretical framework of the lecture, the content covered in the course, and in accordance with the competencies and objectives of the HS scenario.

The intervention adopted was based on the HS, addressing the clinical scenario of Diabetes Mellitus Screening in the context of Primary Health Care¹⁴. The intervention was conducted in two rounds in the clinical simulation laboratory of the University, and for this, the EG was divided into two groups: EG1 (n=8) and EG2 (n=7). In each round, participants were taken from the University premises to the simulation laboratory, guided

by one of the facilitators. Once in the simulation laboratory, participants were welcomed in the anteroom where the *briefing stage took place*, at which time they were introduced to the objectives of the scenario, the rules, the fictitious contract, and the roles within the HS. In addition, one participant was asked to volunteer in the scenario as the nurse responsible for the consultation; this volunteer was introduced to the scenario and the available materials, while the observers were instructed in the anteroom on how to complete the observation *checklist*.

The scenario consisted of a nursing consultation in the context of primary health care with a user presenting typical symptoms of diabetes mellitus (polyuria and polydipsia) and associated risk factors, such as age, smoking, and a family history of diabetes mellitus and hypertension. The volunteer participant performed the simulated consultation for 15 minutes, while the other participants observed using the observer checklist; subsequently, a 30-minute *debriefing was conducted*, in which the participant's performance during the scenario was presented, addressing emotions, followed by an analysis of clinical reasoning processes, communication, and technical skills employed, as well as opinions from the observers and how the participants consolidated their knowledge during the practice, highlighting strengths and opportunities for improvement. After the debriefing, each participant was asked to complete the ESEAA questionnaire.

For processing the collected data, tabulation was performed and subsequently subjected to simple descriptive statistical analysis using *Google Sheets®*. The data were presented as mean and standard deviation (SD). Data relating to losses were not included in the final analysis of the post-test variables.

Ethical aspects

The study was approved on March 13, 2025, by the Research Ethics Committee of the Faculty of Health Sciences of the Universidade de Brasília, under Opinion No. 7,439,422, issued in March 2025. Certificate of Presentation of Ethical Review (CAAE) No. 70070923.9.0000.0030.

RESULTS

The study sample consisted of 33 students who completed the planned stages. Regarding its characteristics, the sample was predominantly female ($n = 31$, 93.9%), with a similar distribution in the control group (CG) ($n = 21$, 91.3%) and experimental group (EG) ($n = 9$, 90%). Regarding age range, the majority of participants were concentrated in the 19–30-year age range ($n = 31$, 93.9%), with all participants in the EG falling within this age range. Table 1 presents the distribution of sex and age range among the study participants.

Table 1 - Sample characterization, Brasília, DF, Brazil, 2025.

Variables	Control Group n(%)	Experimental Group n(%)	Total n(%)
Sex			
Feminine	20 (86.9%)	9 (90%)	29 (87.8%)
Masculine	3 (13.0%)	1 (10%)	4 (12.1%)
Total	23 (100%)	10 (100%)	33 (100%)
Age range			
Up to 18 years old	1 (4.3%)	-	1 (3.0%)
19 to 30 years old	20 (86.9%)	10 (100%)	30 (90.9%)
31 to 40 years old	2 (8.7%)	-	2 (6.0%)
41 to 50 years old	-	-	-

n = absolute frequency; % = relative frequency

Fifteen participants (GE), aged 19 to 30 years, predominantly female (n=14, 93.3%), responded to the ESEAA. Regarding the satisfaction and self-confidence of the participating students, the results show high and similar scores on both subscales (means of 4.92 and 4.83, respectively) (Table 2).

The dimension of Satisfaction with current learning (Table 2) obtained an overall average of 4.92 with a standard deviation (SD) of 0.27, demonstrating a high level of satisfaction among the students who participated in the simulation. Items 1 and 3 obtained the maximum score (mean = 5.0), followed by item 4 (mean = 4.93; SD = 0.25), and items 2 and 5 with the lowest scores, although still with similar values (means 4.8; 4.86/SD = 0.41; 0.35, respectively).

This suggests that participants were highly satisfied with the usefulness and effectiveness of the methodological approaches, the materials used, and the facilitator's performance during the simulation activity. The items also showed high average scores and little dispersion in the response pattern, which may reinforce the consistency of positive perceptions related to planning and execution with methodological resources that favor the alignment of content with the curriculum and the participants' learning style.

Table 2 - Mean and standard deviation of items related to the dimension of "Satisfaction with current learning", Brasília, DF, Brazil, 2025.

Item	Mean (SD)
Satisfaction with current learning	
1. The teaching methods used in this simulation were useful and effective.	5.00 (0.00)
2. The simulation provided me with a variety of teaching materials and activities to further my learning of the medical-surgical curriculum.	4.80 (0.41)
3. I liked the way my teacher taught through simulation.	5.00 (0.00)
4. The teaching materials used in this simulation were motivating and helped me learn.	4.93 (0.25)
5. The way my teacher taught through simulation was suitable for how I learn.	4.86 (0.35)
Total	4.92 (0.27)

SD: standard deviation.

Regarding self-confidence in learning (Table 3), the dimension obtained an overall average of 4.33 and a standard deviation of 0.79, demonstrating that, although students perceived themselves as self-confident, there is considerable variability in the pattern of responses and, therefore, in individual perceptions compared to the previous dimension. Items 9 and 7 obtained the highest scores (averages 4.93; 4.80 and SD = 0.25; 0.41, respectively), followed by items 10 (4.66/0.48), 8 (4.60/0.50), 12 (4.33/0.69) and 11 (4.20/0.9). Items 13 (4.00/1) and 6 (3.53/0.74) presented the lowest averages and the highest standard deviations.

The results suggest that, although a high level of confidence was observed regarding the necessity and suitability of the simulation content to the curriculum, the variation in responses may indicate that some students did not feel fully confident in their mastery of the content covered. Despite demonstrating a significant sense of responsibility (item 10) as students during the learning process, there are still divergences regarding expectations about the facilitator's role in guiding learning (item 13), especially in approaches based on active methodologies, such as simulation. However, the overall self-confidence score indicates that the simulation also had positive effects in this dimension.

Table 3 - Mean and standard deviation of items related to the dimension of "Self-confidence in learning", Brasília, DF, Brazil, 2025.

Item	Mean (SD)
Self-confidence in learning	
6. I am confident that I have mastered the content of the simulation activity that my teacher presented to me.	3.53 (0.74)
7. I am confident that this simulation included the necessary content for mastering the medical-surgical curriculum.	4.80 (0.41)
8. I am confident that I am developing the skills and gaining the necessary knowledge from this simulation to perform the required procedures in a clinical setting.	4.60 (0.50)
9. My teacher used helpful resources to teach the simulation.	4.93 (0.25)
10. It is my responsibility as a student to learn what I need to know through the simulation activity.	4.66 (0.48)
11. I know how to get help when I don't understand the concepts covered in the simulation.	4.20 (0.9)
12. I know how to use simulation activities to learn skills.	4.33 (0.69)
13. It is the teacher's responsibility to tell me what I need to learn about the topic covered in the simulation during class.	4.00 (1.00)
Total	4.83 (0.79)

SD: standard deviation.

Thirty-three students who were present during the assessment completed the knowledge retention assessment phase; of these, 10 were from the experimental group (EG) and 23 from the control group (CG). Regarding the pre-test, the average scores were similar between the CG and EG, 8.29 and 8.72 respectively. In the post-test, the EG obtained a higher knowledge retention score compared to the CG, with 9.70 and 9.30 respectively. The data are presented in Table 4.

Table 4 - Evaluation of content retention of students from the EG (n = 10) and CG (n = 33) groups, Brasília, DF, Brazil, 2025.

	Average	SD	Median
Experimental Group			
Pre-test	8.72	1.49	9
Post-test	9.70	0.48	10
Control Group			
Pre-test	8.29	1.34	10
Post-test	9.30	1.01	10

SD: standard deviation.

In the experimental group (EG), an increase in the mean (from 8.72 to 9.70) and a decrease in the standard deviation (from 1.49 to 0.48) were observed, and this inverse relationship demonstrates an improvement in knowledge retention and less variation in responses after the intervention. It can be inferred that the intervention had a significant impact on delayed knowledge retention in the EG. Meanwhile, in the control group (CG), an increase in the mean (from 8.29 to 9.30) and a slight reduction in the standard deviation (from 1.34 to 1.01) were also observed, indicating that even with a gain in the mean, there was still greater dispersion in response patterns when compared to the EG.

Therefore, although the control group (CG) obtained a greater variation in the final average, the result of the experimental group (EG) is more concise regarding the gain in knowledge, given the greater uniformity of responses, which reinforces the positive impact of the intervention on knowledge retention when comparing the groups.

DISCUSSION

This study sought to measure satisfaction and self-confidence in learning, and knowledge retention of nursing students through the replication of HS on DM screening in primary health care. The results demonstrated that students presented high levels of satisfaction, self-confidence, and knowledge retention after the HS. The characteristics of the participants remained similar to the initial stage, with a predominance of females and ages between 19 and 30 years, which is consistent with other studies that also point to a student profile with a higher proportion of females and younger people in nursing courses, which is reflected in the workforce of the historically female-majority category¹⁵⁻¹⁶.

Regarding satisfaction, high scores were found, mainly in key aspects, demonstrating that, at the time of evaluation, students showed high levels of satisfaction with the simulation. This finding is consistent with previous investigations that also used SS as an intervention and observed high satisfaction rates, especially for items that assessed the usefulness of the methods and how the teacher conducted the activity, as well as in the present study, where these items reached a maximum score of $f_{5,17-18}$.

Regarding self-confidence in learning, although there was greater variability in responses, indicating different levels of confidence in relation to the scenario, the overall score was high, especially in items related to the importance of the content, the student's role in the learning process, and the suitability of resources to the curriculum. These results are consistent with studies that have shown the positive effect of HS on students' self-confidence^{5,18-20}.

The items with the lowest scores, relating to content mastery and teacher responsibility, are also similar to those found in other studies, suggesting that, although HS is effective in promoting self-confidence, it is still necessary to pay attention to clarity regarding the content to be taught and the teacher's role, especially in active methodologies, reinforcing the importance of simulation design as an essential part of HS¹⁷⁻¹⁸.

Regarding knowledge retention, the findings demonstrated gains in both groups; however, the interpretation of these results is limited to the sample due to the analysis method employed. Thus, it was observed that the experimental group (EG) showed a more significant improvement in the average of responses and a decrease in the variability in its pattern, which may indicate a possible almost uniform gain in knowledge after the intervention in this group. These data suggest that the strategy contributed to consolidating relevant content related to the topic, corroborating studies that highlight the role of HS as a resource capable of favoring knowledge acquisition, improving learning, and enhancing student performance compared to traditional methods²¹⁻²².

In this sense, the controlled and safe environment provides an opportunity to develop familiarity with the clinical setting, procedures and, especially, with the possibility of learning from mistakes, mitigating feelings of uncertainty, stress and anxiety associated with clinical environments and promoting self-confidence²²⁻²⁶.

Although HS promotes such educational outcomes, isolated or limited sessions do not offer sufficient time for students to practice and develop skills for clinical practice. Thus, evidence suggests that, to achieve these goals and enable the transfer of skills to practice, repetition of HS experiences is necessary²⁶. As demonstrated in an experimental study with South Korean students, in which experiencing consecutive sessions resulted in a reduction of negative emotions and increased levels of self-confidence in the students²⁷.

Thus, HS not only improves performance during graduation, but also prepares students for clinical practice, especially with regard to decision-making, since it promotes increased self-confidence and, consequently, satisfaction, feelings of accomplishment and security of the professional during their performance^{22,28}.

Thus, it can be inferred that the acquisition of communication, clinical judgment, and decision-making skills throughout academic training favors their transfer to clinical practice and contributes to the improvement of professional performance, which can be facilitated by experience with HS²⁸⁻³⁰.

The results found in this and other studies that used HS as an intervention have been related to the quality of the simulation design elements, which are associated with better learning outcomes^{19,31}. These studies indicate that the assertiveness of the objectives, the provision of relevant information before and during the simulation, as well as the facilitator's support, play a fundamental role in promoting satisfaction and self-confidence, in addition to psychologically preparing students for the scenario.

While psychological safety and clarity of objectives have a more positive impact on satisfaction, self-confidence is especially strengthened by active learning, constructive feedback, and self-evaluative reflection, which can be promoted in debriefing³². Debriefing stands out as a predictor of learning, associated not only with satisfaction and self-confidence, but also with the retention of content and skills, by enabling reflection on one's strengths, areas for improvement, and knowledge gaps, reinforcing learning through critical thinking^{28,33}.

Thus, it is evident that the design reinforces the effectiveness of HS as an educational methodology for training more confident and competent nurses, and despite these promising results, most studies using HS focus on hospital, emergency or critical care settings, while PHC, considered the preferred entry point to the health system, is still little explored as a field of application^{28,34-35}.

Considering the importance of Primary Health Care (PHC) and the epidemiological relevance of Diabetes Mellitus (DM), including students in this context through HS not only strengthens educational and interpersonal skills, but also has the potential to improve the quality of care in this context. Therefore, we highlight the need for further studies focused on developing scenarios that have PHC as a backdrop, to consolidate SS as an effective teaching methodology at all levels of health care.

Based on the findings of this study, it is observed that the developed scenario, as well as others that are part of the larger project, has been incorporated into the learning program of curricular units that address topics related to wound care, in addition to the discipline in which the data collection took place. This integration is related to the transformative impact of using the HS in the course and the discipline, to the teachers' contact with the methodology, to the use of institutional spaces, such as laboratories for simulation, and to the expansion of the use of Active Methodologies in teaching. This movement has contributed to the innovation of educational processes in the discipline and in the undergraduate Nursing course.

The results of this study make important contributions to the field by demonstrating the potential of HS in acquiring educational and interpersonal skills for learning, as well as by placing students in the context of Primary Health Care (PHC), which is still little explored as a simulation setting, and which can contribute to improving the quality of care provided at this level of attention.

Limitations

This study was limited by sample loss throughout the stages, which may have restricted its representativeness and, consequently, the generalizability of the findings. Although the results were based on simple descriptive statistical analysis, without the use of more robust data analysis methods that could have allowed for additional intragroup comparisons, they still provide consistent evidence of the potential of HS in nursing education. Furthermore, our findings may support future investigations that use larger samples and more comprehensive statistical analyses.

CONCLUSION

The findings of this study demonstrated that nursing students who participated in the application of the "Health Simulation for Diabetes Mellitus Screening in Primary Health Care" scenario showed high scores for

satisfaction, self-confidence, and knowledge retention. The simulation is effective in integrating theory and practice because it fosters the development of cognitive skills and clinical reasoning essential for professional practice, in addition to highlighting the importance of using validated instruments in evaluating educational outcomes in nursing training.

Although there is the limitation of a restricted sample and an analysis that limits its generalization, it favored the applicability of the scenario in the research setting and broadened the possibility of using simulation methodology in the course and discipline in which it was implemented. The use of simulation promoted innovation in the discipline and allowed students to engage with a methodology that had not previously been used to address the topic of diabetes mellitus screening in primary health care.

Given that most studies using this methodology focus on the context of care in critical and high-risk situations, this work contributes to the expansion of Healthcare Simulation within the context of primary health care, especially regarding chronic non-communicable diseases, a field still little explored by simulation researchers, despite its great relevance. It is recommended that future research expand this field of application, in order to consolidate Healthcare Simulation as an effective teaching methodology at all levels of healthcare.

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REFERENCES

1. Lioce LLJ, Anderson M, Deutsch ES, Downing D, Robertson JM, Diaz DA, et al. Healthcare Simulation Dictionary—Third Edition [Internet]. Rockville (MD): Agency for Healthcare Research and Quality; 2025 [cited 2025 Aug 04]. Available at: <https://www.ahrq.gov/patient-safety/resources/simulation/terms.html>.
2. International Nursing Association for Clinical Simulation and Learning. Healthcare Simulation Standards of Best Practice® [Internet]. Barueri (SP): Laerdal; 2023 [cited 2025 Aug 04]. Available at: <https://www.inacsl.org>.
3. Costa RRO, Medeiros SM, Coutinho VRD, Veríssimo CMF, Silva MANCGMM, Lucena EES. Simulação clínica no desempenho cognitivo, satisfação e autoconfiança na aprendizagem: estudo quase-experimental. *Acta Paul Enferm* [Internet]. 2020 [cited 2025 Aug 04];33:eAPE20180123. DOI: <https://doi.org/10.37689/acta-ape/2020AO01236>.
4. Santos LC, Conceição KO, Melo MS, Barreiro MSC, Freitas CKA, Rodrigues IDC. Características e repercussões da simulação como estratégia de ensino-aprendizagem em enfermagem: revisão integrativa. *Arq Ciênc Saúde* [Internet]. 2020 [cited 2025 Aug 04];27(1):70-5. DOI: <https://doi.org/10.17696/2318-3691.27.1.2020.1911>.
5. Teixeira A, Tavares JP, Cogo ALP. Satisfação e autoconfiança de estudantes de enfermagem como atuantes e observadores em simulação realística. *Rev Gaúcha Enferm* [Internet]. 2022 [cited 2025 Aug 08];43:e20210344. DOI: <https://doi.org/10.1590/1983-1447.2022.20210344.pt>.
6. Linn AC, Souza EN, Caregnato RCA. Simulation in cardiorespiratory arrest: assessment of satisfaction with the learning of nursing students. *Rev Esc Enferm USP* [Internet]. 2021 [cited 2025 Aug 04];55:e20200533. DOI: <https://doi.org/10.1590/1980-220X-REEUSP-2020-0533>.

7. Almeida RGS, Mazzo A, Martins JCA, Baptista RCN, Girão FB, Mendes IAC. Validação para a língua portuguesa da escala Student Satisfaction and Self-Confidence in Learning. *Rev Latino-Am Enfermagem* [Internet]. 2015 [cited 2025 Aug 04];23(6):1007-13. DOI: <https://doi.org/10.1590/0104-1169.0472.2643>.
8. Mano L, Mazzo A, Torres Neto JR, Cotta Filho CK, Goncalves VP, Ueyama J, et al. The relation of satisfaction, self-confidence and emotion in a simulated environment. *Int J Nurs Educ Scholarsh* [Internet]. 2019 [cited 2025 Aug 04];16(1):20180009. DOI: <https://doi.org/10.1515/ijnes-2018-0009>.
9. Ausubel DP. The acquisition and retention of knowledge: A cognitive view [Internet]. 1st ed. Springer Science & Business Media; 2000 [cited 2025 Aug 05]. Available at: <https://link.springer.com/book/10.1007/978-94-015-9454-7>.
10. Farias GB. Contributos da aprendizagem significativa de David Ausubel para o desenvolvimento da competência em informação. *Perspect Ciênc Inf* [Internet]. 2022 [cited 2025 Aug 05];27(2):58-76. DOI: <https://doi.org/10.1590/1981-5344/39999>.
11. Cartaxo CJM, Souza ML, Santos PHF, Cauduro FLF. Cenário de simulação para rastreio de diabetes mellitus. *Rev Recien* [Internet]. 2024 [cited 2025 Jul 17];14(42):629-44. Available at: <https://www.recien.com.br/index.php/Recien/article/view/870>.
12. Polit DF, Beck CT. Fundamentos de pesquisa em enfermagem: avaliação de evidências para a prática da enfermagem. Porto Alegre: Artmed; 2019.
13. Ministério da Saúde (BR). Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Estratégias para o cuidado da pessoa com doença crônica: diabetes mellitus [Internet]. Brasília: Ministério da Saúde; 2013 [cited 2025 Mar 20]. 160 p. (Cadernos de Atenção Básica; 36). Available at: https://www.gov.br/conitec/pt-br/midias/pdf/caderno_atencaobasica36.pdf.
14. Bahia L, Almeida-Pititto B. Tratamento do diabetes mellitus tipo 2 no SUS. In: Sociedade Brasileira de Diabetes. Diretriz oficial da Sociedade Brasileira de Diabetes 2024 [Internet]. São Paulo: SBD; 2024 [cited 2025 Aug 05]. Available at: <https://diretriz.diabetes.org.br/tratamento-do-dm2-no-sistema-unico-de-saude-sus/>.
15. Rodrigues TS, Faustino AM. Homens e mulheres na enfermagem: uma análise histórica quantitativa dos estudantes na Universidade de Brasília. *Rev Foco* [Internet]. 2024 [cited 2025 Aug 20];17(5):e5057. DOI: <https://doi.org/10.54751/revistafoco.v17n5-039>.
16. World Health Organization. State of the world's nursing 2020: investing in education, jobs, and leadership [Internet]. Geneva: World Health Organization; 2020 [cited 2025 Aug 20]. 116 p. Available at: <https://iris.who.int/server/api/core/bitstreams/5d564226-7418-4c10-9fb3-08d7e09626ec/content>.
17. Butafava EPDA, Oliveira RAD, Quilici AP. Satisfação e autoconfiança de estudantes na simulação realística e a experiência de perpetuação do saber. *Rev Bras Educ Med* [Internet]. 2022 [cited 2025 Aug 20];46(4). DOI: <https://doi.org/10.1590/1981-5271v46.4-20210479>.
18. Cabañero-Martínez MJ, García-Sanjuán S, Escribano S, Fernández-Alcántara M, Martínez-Riera JR, Juliá-Sanchís R. Estudo de método misto sobre a satisfação de um programa de simulação de alta fidelidade em uma amostra de estudantes do curso de enfermagem. *Enfermeira Educ Hoje* [Internet]. 2021 [cited 2026 Oct 09]. DOI: <https://doi.org/10.1016/j.nedt.2021.104858>.
19. Cho MK, Kim MY. Factors Associated with Student Satisfaction and Self-Confidence in Simulation Learning among Nursing Students in Korea. *Healthcare* [Internet]. 2023 [cited 2025 Aug 04];11(8):1060. Available at: <https://pmc.ncbi.nlm.nih.gov/articles/PMC10138033/>.

20. Moreno-Cámara S, da-Silva-Domingues H, Parra-Anguila L, Gutiérrez-Sánchez B. Evaluating Satisfaction and Self-Confidence among Nursing Students in Clinical Simulation Learning. *Nursing Reports* [Internet]. 2024 [cited 2025 Aug 20];14(2):1037-48. Available at: <https://pmc.ncbi.nlm.nih.gov/articles/PMC11130807/>.
21. Alharbi A, Nurfianti A, Mullen RF, McClure JD, Miller WH. The effectiveness of simulation-based learning (SBL) on students' knowledge and skills in nursing programs: a systematic review. *BMC Medical Education* [Internet]. 2024 [cited 2025 Aug 18];24(1). DOI: <https://doi.org/10.1186/s12909-024-06080-z>.
22. El Hussein MT, Hirst SP. High-Fidelity Simulation's Impact on Clinical Reasoning and Patient Safety: A Scoping Review. *Journal of Nursing Regulation* [Internet]. 2023 [cited 2025 Aug 20];13(4):54-65. DOI: [https://doi.org/10.1016/S2155-8256\(23\)00028-5](https://doi.org/10.1016/S2155-8256(23)00028-5).
23. Ruiz-Fernández MD, Alcaraz-Córdoba A, López-Rodríguez MM, Fernández-Sola C, Granero-Molina J, Hernández-Padilla JM. The effect of home visit simulation on emotional intelligence, self-efficacy, empowerment, and stress in nursing students. A single group pre-post intervention study. *Nurse Education Today* [Internet]. 2022 [cited 2025 Aug 20];117:105487. DOI: <https://doi.org/10.1016/j.nedt.2022.105487>.
24. Silva GO, Silva e Oliveira F, Coelho ASG, Cavalcante AMRZ, Vieira FVM, Fonseca LMM, et al. Effect of simulation on stress, anxiety, and self-confidence in nursing students: Systematic review with meta-analysis and meta-regression. *International Journal of Nursing Studies* [Internet]. 2022 [cited 2025 Aug 18];133:104282. DOI: <https://doi.org/10.1016/j.ijnurstu.2022.104282>.
25. Tabriz ER, Sadeghi M, Tavana E, Miri HH, Nabavi FH. Approaches for boosting self-confidence of clinical nursing students: A systematic review and meta-analysis. *Heliyon* [Internet]. 2024 [cited 2025 Aug 18];10(6):e27347. DOI: <https://doi.org/10.1016/j.heliyon.2024.e27347>.
26. Alshehri FD, Jones S, Harrison D. The effectiveness of high-fidelity simulation on undergraduate nursing students' clinical reasoning-related skills: A systematic review. *Nurse Education Today* [Internet]. 2022 [cited 2025 Aug 18];121:105679. DOI: <https://doi.org/10.1016/j.nedt.2022.105679>.
27. Yu JH, Chang HJ, Kim SS, Park JE, Chung WY, Lee SK, et al. Effects of high-fidelity simulation education on medical students' anxiety and confidence. *PloS One* [Internet]. 2021 [cited 2025 Aug 19];16(5):e0251078. DOI: <https://doi.org/10.1371/journal.pone.0251078>.
28. Tamilselvan C, Chua SM, Chew HSJ, Devi MK. Experiences of simulation-based learning among undergraduate nursing students: A systematic review and meta-synthesis. *Nurse Education Today* [Internet]. 2023 [cited 2025 Aug 19];121:105711. DOI: <https://doi.org/10.1016/j.nedt.2023.105711>.
29. Cura ŞÜ, Kocatepe V, Yıldırım D, Küçükakgün H, Atay S, Ünver V. Examining Knowledge, Skill, Stress, Satisfaction, and Self-Confidence Levels of Nursing Students in Three Different Simulation Modalities. *Asian Nursing Research* [Internet]. 2020 [cited 2025 Aug 19];14(3):158-64. DOI: <https://doi.org/10.1016/j.anr.2020.07.001>.
30. Nair MA, Muthu P, Abuijlan IAM. The Effectiveness of High-Fidelity Simulation on Clinical Competence Among Nursing Students. *SAGE Open Nursing* [Internet]. 2024 [cited 2025 Aug 26];10. DOI: <https://doi.org/10.1177/23779608241249357>.
31. Gabbouj SB, Zedini C, Naija W. Nursing Students' Satisfaction and Self-Confidence with Simulation-Based Learning and Its Associations with Simulation Design Characteristics and Educational Practices. *Advances in Medical Education and Practice* [Internet]. 2024 [cited 2025 Aug 19];15:1093-102. DOI: <https://doi.org/10.2147/AMEP.S477309>.

32. Blaak H, Lkoul A, Iziki H, El Haddaouy A, Kharabch A, Razine R, et al. Satisfaction and Self-Confidence of Moroccan Nursing Students in Simulation-Based Learning and Their Associations with Simulation Design Characteristics and Educational Practices. *Nursing Reports* [Internet]. 2025 [cited 2025 Aug 18];15(5):138-8. Available at: <https://www.mdpi.com/2039-4403/15/5/138>.
33. Li Z, Huang FF, Chen SL, Wang A, Guo Y. The Learning Effectiveness of High-Fidelity Simulation Teaching Among Chinese Nursing Students. *Journal of Nursing Research* [Internet]. 2020 [cited 2025 Aug 19]. Available at: <https://journals.lww.com/jnr-tna/pages/articleviewer.aspx?year=2021&issue=04000&article=00004&type=Fulltext>.
34. La Cerra C, Dante A, Caponnetto V, Franconi I, Gaxhja E, Petrucci C, et al. Effects of high-fidelity simulation based on life-threatening clinical condition scenarios on learning outcomes of undergraduate and postgraduate nursing students: a systematic review and meta-analysis. *BMJ Open* [Internet]. 2019 Feb [cited 2025 Aug 19];9(2):e025306. Available at: <https://bmjopen.bmj.com/content/9/2/e025306>.
35. Yamane MT, Machado VK, Osternack KT, Mello RG. Simulação realística como ferramenta de ensino na saúde: uma revisão integrativa. *Espac. Saude* [Internet]. 2019 [cited 2026 Jun 18];20(1):87-107. Available at: <https://espacoparasaude.fpp.edu.br/index.php/espacosaude/article/view/651>.

