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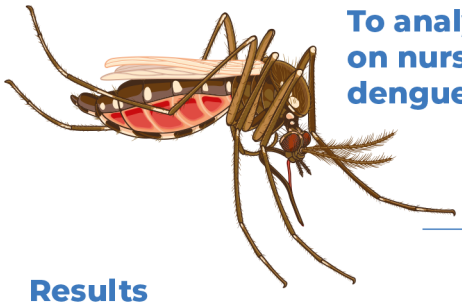
Nursing education: use of clinical simulation in the care of patients with dengue fever



To analyze the impact of clinical simulation on nursing students' learning regarding dengue fever with warning signs

Participation of third-term undergraduate nursing students

Results

- High level of student engagement
- Improvement in logical reasoning, self-confidence, and patient communication
- Most students correctly identified the suspicion of dengue fever
- Difficulties in recognizing warning signs, which enhanced the debriefing and stimulated reflection on decision-making

It contributed to the training of better-prepared nurses for qualified performance in Primary Health Care

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DOI

DOI: 10.31744/einstein_journal/2026AO2278

In Brief

A mixed-methods study evaluated the impact of clinical simulations on dengue management among 36 nursing students. The results point to gaps in physical examination and uncertainty in risk classification but highlight simulation as a safe environment for error and learning, and the development of clinical reasoning, metacognition, and communication in primary care.

Highlights

- Clinical simulations enhance dengue management and clinical reasoning in undergraduate studies.
- Mixed methods revealed gaps in physical examinations and uncertainties in risk classification.
- Structured debriefing promotes metacognition and critical reflection on errors.
- Realistic scenarios strengthen empathetic communication and enhance patient safety.

How to cite this article:

Cordeiro TL, Bucco M, Osternack KT, Ogradowski KR. Nursing education: use of clinical simulation in the care of patients with dengue fever. einstein (São Paulo). 2026;24(Spec 1):eAO2278.

einstein
Official Publication of the Instituto Israelita de Ensino e Pesquisa Albert Einstein

e-ISSN: 2317-6385

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Nursing education: use of clinical simulation in the care of patients with dengue fever

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DOI: 10.31744/einstein_journal/2026AO2278

ABSTRACT

Objective: To analyze how clinical simulation impacts nursing students' proficiency in clinical evaluation, decision-making, therapeutic communication, and reporting of dengue fever with warning signs within a primary health care context. **Methods:** Third-term nursing undergraduates participated in the activity, which involved a standardized patient, a 45-year-old female with persistent vomiting, fever, and abdominal pain after a trip to an endemic dengue area. A structured checklist was used to assess their performance in terms of diagnostic suspicion, anamnesis, physical examination, tourniquet test, recognition of severity signs, completion of the reporting formulary, patient referral decisions, and communication with the patient. The actor received detailed instructions to ensure realism and standardization. This project followed ethical tenets and was approved by the Research Ethics Board. **Results:** Students showed high engagement, with improvements in their logical reasoning, confidence in approaching patients, and communication. Most of them correctly identified dengue fever suspicion, although they had difficulties recognizing the warning signs, which enriched the debriefing and promoted reflection on decision-making. **Conclusion:** Clinical simulation is a powerful tool for teaching dengue fever and integrating theory and practice. Thus, it provides significant learning and strengthens the education of better-prepared nurses for qualified performance in primary healthcare.

Keywords: Simulation training; Nursing; Dengue; Primary health care; Health education

INTRODUCTION

Clinical simulation (CS) has been established as an essential active methodology in health education, as it enables the creation of realistic, controlled settings that foster safe and supervised learning. In addition to its role as a teaching tool, CS contributes to the assessment, research, and development of cognitive, technical, and attitudinal competencies. Promoting students' active participation stimulates their clinical reasoning, decision-making, and critical thinking in professional practice, thus fostering a more solid and meaningful education.[1]

The search for qualified and prepared nursing professionals to manage complex situations has made CS an increasingly common strategy in nursing graduation curricula. This methodology enables the development of specific skills that meet the demands of care delivery at different complexity levels. During the simulations, undergraduates experienced situations that reproduced clinical settings, performed procedures, carried out interventions, and made decisions in a context similar to their professional reality.[2,3]

Considering that nursing education must contemplate emerging themes consistent with the Brazilian epidemiological scenario, it is essential to address arboviral fevers and diseases of increasing relevance to Brazilian public health.

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Cordeiro TL, Bucco M, Osternack KT, Ogradowski KR. Nursing education: use of clinical simulation in the care of patients with dengue fever. einstein (São Paulo). 2026;24(Spec 1):eAO2278.

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Received on:
Nov 13, 2025

Accepted on:
Jan 12, 2026

Conflict of interest:
none.

The significant increase in dengue fever cases in recent years indicates the need for assertive professional performance, especially in primary health care (PHC), to prevent diagnostic delays, overcrowded services, and other preventable complications.

Therefore, this study is justified by the need to assess and understand the impact of CS on nursing undergraduates' proficiency in the face of dengue fever, a current public health issue. Training future nurses in the early recognition of warning signs, clinical reasoning, and proper decision-making is essential to enhance safe problem-solving practices within primary healthcare.

OBJECTIVE

To analyze the impact of the clinical simulation of a dengue fever case with warning symptoms on nursing students' learning, focusing on their skills in clinical evaluation, decision-making, therapeutic communication, and disease reporting in primary health care.

METHODS

Study design

This was a mixed methods study, integrating qualitative and quantitative approaches to enhance the understanding of the impact of CS on the learning process, according to Creswell's recommendations.[4]

Subjects

Thirty-six undergraduates, attending the third term of the nursing course and enrolled in the discipline "Adult and Elderly Caring Process," participated in the study and met the inclusion criteria. Undergraduates on sick or maternity leave were excluded from the study. The simulations were carried out with groups of six participants; in each session, two students were assigned the caring process, while the others observed it using a structured checklist to monitor critical actions.

Data collection

The study was conducted at the clinical simulation center of a higher education institution, structured with specific rooms for briefing, simulation, and debriefing, as well as environments designed to replicate highly realistic care delivery scenarios. The facility provided standardized patients, that is, simulated actors and actresses, as well as various realistic mannequins to be used according to the complexity of each scenario.

The scenario consisted of care delivered to a standardized patient, acted upon by a trained actor in a PHC unit. The clinical case involved a 45-year-old woman who recently visited an endemic area with symptoms and warning signs of dengue fever. The students were asked to review the Dengue Clinical Care Flowchart from a previous study, based on the updated version released by the Ministry of Health (MH), as preparation for the simulation.[5] The actor received a detailed script with the medical history, complaints, expected answers, and specific behaviors for interaction standardization. The evaluative checklist included items related to diagnostic suspicion, directed anamnesis, physical examination, performance and correct technique of the tourniquet test, identification of signs of severity, completion of the reporting formulary, and decision-making for patient referral.

Each scenario lasted approximately 10 min, followed by structured and metacognitive debriefing, as proposed by Cordeiro,[6] and lasted 20 min.

Data collection was carried out between February and June 2025 using four complementary sources: (a) field diary notes kept by the researchers during participant observation, (b) audio and video recordings from all simulation steps, (c) application of the structured checklist, and (d) semi-structured interviews conducted after the debriefing.

The adoption of participant observation aimed to foster group interaction and context understanding of the studied phenomena, according to Queiroz et al.[7] The field diary included descriptions of the scenario, learning objectives, setting preparation, simulation conduction, and emerging aspects of the interactions.

A semi-structured questionnaire comprising questions on experience, decision-making, and learning perceptions was administered after each team participated in the simulations. The script was submitted to a pilot test to ensure question clarity and relevance.

The checklist was developed and refined over three semesters by the simulation center of the institution, comprising items regarding the critical actions of the scenario, which enabled the assessment of students' performance in recognizing warning signs, attitudes, and therapeutic communication.

Data analysis

The interviews were recorded, transcribed, and analyzed according to the content analysis technique proposed by Bardin,[8] identifying the participants encoded by "E" followed by a number (E1 to E36) to maintain confidentiality. Quantitative data were tabulated on

Excel spreadsheets and submitted for descriptive analysis to calculate the absolute frequencies and percentage distributions.

Ethical aspects

The study was approved by the Research Ethics Board of the *Faculdade Pequeno Príncipe*, CAAE: 86319724.4.0000.5580; # 7.425.546.

RESULTS

Thirty-six undergraduates students in the third term of the nursing course participated in this study. They were divided into six simulation groups. Most were female (91.7%) aged 17–43 years.

All participants correctly diagnosed dengue fever based on signs, symptoms, and trip events. They also performed and interpreted the tourniquet tests. However, none of the students conducted abdominal examinations. Clinical history was confirmed in part of the sample. The reporting form was properly completed by most participants, but referrals for hospitalization and patient guidance were rarely performed by the participants. Detailed data are shown in table 1.

Analysis of the structured checklists applied during the simulated scenarios revealed recurrent gaps in the undergraduates' performance. Most of them only performed the anamnesis without conducting a focused physical examination, an essential step to qualify the clinical assessment and support diagnostic reasoning. This failure directly affected the ability to recognize the warning signs of dengue fever and correctly classify patients according to the clinical care management flowchart proposed by the MH.

During the debriefing, accounts emerged that corroborated these findings and revealed the students' reflective processes. The participants reported a lack of confidence in classifying the different groups of clinical care management for dengue fever, particularly in distinguishing between groups B and C, and acknowledged the importance of physical examination and careful assessment for decision-making.

> *"Distinguishing between B and C is hard, even more if the patient is clinically well; it is difficult to assess and make a decision (E1)."*
>
> *"The worst part is the change in your approach: one patient can be sent home, while the other must be kept under observation; you cannot make a mistake (E5)."*
>
> *"In fact, she had the clinical symptoms of dengue and persistent abdominal pain, which is a warning sign, but the physical exam may clarify that (E32)."*
>
> *"Now I have realized that I did not perform the physical exam, only the anamnesis. I should have carried out an abdominal examination in a patient with dengue fever (E25)."*
>
> *"The questions could be better structured, something like: when did the patient start vomiting and how often? A lot of vomiting means I need to check for signs of dehydration, because then I can move her into group D (E22)."*

Difficulty was also observed in defining appropriate initial actions, particularly regarding patient referral and the implementation of immediate therapeutic measures such as volemic replacement. These issues were identified in the checklists and became a central focus of discussion during the debriefing.

> *"And could I not have already administered IV fluid? To hydrate? Of course I could have and I did not do that. As a nurse in the family health strategy, I could have requested it (E3)."*
>
> *"I think it was a serious failure not to have hydrated the patient; it was necessary (E22).*

Verbal communication was limited at times, revealing the difficulty of students to maintain assertive and have

Table 1. Undergraduates' performance in the simulation checklist of dengue fever management in primary health care (n=36)

Assessed item	Not done n (%)	Partially adequate n (%)	Adequate n (%)
Dengue suspicion due to signs and symptoms	0 (0.0)	0 (0.0)	36 (100.0)
Dengue suspicion due to the trip to an endemic area	0 (0.0)	0 (0.0)	36 (100.0)
Confirmed complete clinical history	0 (0.0)	12 (33.3)	24 (66.7)
Performed abdominal examination	36 (100.0)	0 (0.0)	0 (0.0)
Performed tourniquet test correctly	0 (0.0)	0 (0.0)	36 (100.0)
Interpreted the tourniquet test correctly	0 (0.0)	0 (0.0)	36 (100.0)
Filled out the reporting form	4 (11.1)	10 (27.8)	22 (61.1)
Recognized the severity of the dengue signs	32 (88.9)	1 (2.8)	3 (8.3)
Referred to hospitalization	33 (91.7)	0 (0.0)	3 (8.3)
Guided patient on the decision	28 (77.8)	5 (13.9)	3 (8.3)

fluid interaction, which is essential to establish a bond with the patient. Aspects of nonverbal communication, such as body posture, facial expressions, and eye contact, were also observed, which sometimes conveyed a lack of confidence or detachment. During the debriefing, the students acknowledged the importance of clear and empathetic communication, especially for guiding therapeutic measures.

"Guidance on oral hydration applies to all cases. It is good guidance, isn't it? I think that, as a nurse, you can make a difference by speaking and ensuring that the patient understands what they should take, how much, and how, such as homemade oral hydration, rest, and fever reducers, and by checking whether the patient has really understood (E1)."

"That is is very important in primary health care, where you can follow up the patient. However, establishing a bond is also necessary (E36)."

Care management and monitoring of the entrance to the Brazilian Public Health System (SUS - *Sistema Único de Saúde*) were also raised in the debriefing, highlighting the importance of nurses' assertive performance in the organization of the flow of care delivery and the care-delivery priority in high-demanding settings. The discussions reflected the professionals' role during decision-making and care delivery, particularly in endemic situations and service overcrowding.

"Before the simulation, I was not going to perform nursing consultation to that patient, I was going to release her. Now, my perception has changed a lot (E34)."

"No, group A is not hospitalized, because in an endemic scenario, the hospital is overcrowded, you cannot admit everyone. You need to guide and release; as a nurse, you need to know how to do that (E22)."

The interviews conducted after the CS focused on the identification of the cognitive and metacognitive processes performed by the students and on the analysis of the efficacy of the methodology in nursing teaching. Initially, participants highlighted the importance of making mistakes as an essential part of learning, relating it to knowledge consolidation and strengthening professional self-confidence. CS was acknowledged as a safe environment for that practice, in which a mistake does not put patients at risk and turns them into an opportunity for growth.

"The CS was very nice, it was amazing. There are things that I had forgotten, and I never will anymore. The experience was awesome (E13)."

"In fact, I have realized that the more mistakes I make there (in the CS), the more I learn (E11)."

"The experience (the CS) was awesome; I never thought I would learn so much in such a short time (E2)."

The accounts also highlighted the metacognition exercise when students mentally revisited their experiences to improve their future performance.

"In the end, I always think that I need to study more (E3)."

"After the end, I review every step and keep wondering how I would do it if I re-lived that experience (E25)."

"You are going to study, and in practice, you are going to feel whether you did a good or bad job studying (E36)."

These reflections emphasize the experimental and procedural nature of learning provided by CS, which fosters self-knowledge and critical thinking about one's performance. The participants were aware of their cognitive processes and revealed their knowledge, skills, and metacognitive experiences in their accounts.

"I think it is good to see the theme in that way (in the CS model). You get oriented and design a line of reasoning. You know whether the path you follow is good or bad and you can guide yourself using clinical reasoning (E8)."

"In order to learn, I seem to have a mental checklist of the steps required (sort of, I've already seen that, next, now I'm going to focus on that). I rely on some material to remember, that is sort of my strategy (E4)."

"'Now, I am not going to fail with a real patient, I feel confident, I am not going to make a mistake (E1)."

"Previous, well-adjusted study helped me a lot, I remembered what I learned and applied it (E24)."

Finally, the simulation also led to reflections on the responsibility and complexity of care in clinical practice, leading some students to acknowledge the cognitive, emotional, and ethical demands of professional performance.

"It was a bit scary: 'my God, will I have to know all that?' As we realize the responsibility involved, it becomes a lot to manage (E2)."

"I think it is nice to keep thinking that it is you with a real patient. Then, you realize that you need to improve; after all, tomorrow you're going to be with a real patient (E33)."

DISCUSSION

The clinical care management of patients with dengue fever represents an increasing demand in the Brazilian context, especially during endemic periods, when SUS entrypoints become overcrowded.[5,9,10] In this scenario, the assertive performance of nurses in primary

healthcare is essential for timely care and follow-up of care delivery. Qualified listening, grounded decision-making, and proper patient guidance are differentials in nursing practice in this context.[11,12]

The development of logical reasoning and mastery of the steps in the nursing process are fundamental for nurses to perform autonomously and assertively. These, aligned with a theory, support care in five "interrelated, interdependent, recurrent, and cyclical" steps, as follows: assessment, which entails data collection, diagnosis, planning, implementation, and nursing evaluation. They grant scientificity and systematization to professional practices.[13] Particularly, the evaluation grounds the other steps, demanding competencies for nurses to perform detailed anamnesis and physical examination, oriented to each patient's complaint and clinical context.[14]

In this sense, the curricula of nursing graduation courses must strengthen the teaching of such techniques, articulate content, and promote knowledge connections. One of the great challenges consists of promoting integration between theory and practice, allowing students to understand the purpose of each step in the nursing process and knowing how to apply it in a contextualized way. Therefore, realizing what to ask, what to examine, and how to interpret the findings is essential for grounded, safe, and assertive care.[15]

In this context, CS emerges as an active, efficient, and transformative methodology that integrates theoretical knowledge into practice in realistic scenarios. By experiencing situations that reproduce their professional reality, students are encouraged to reflect on, decide, and justify their attitudes, thereby strengthening their clinical reasoning and facilitating meaningful learning.[3,16] Moreover, CS favors the internalization of the nursing process as a guiding care tool, allowing students to understand its scientific and caring values.[17]

Communication is an essential cross-sectional axis in healthcare. Clinical simulation has evolved as one of the main challenges and greatest opportunities for development. Assertive empathetic communication is essential for therapeutic bonding and patient safety, because communicative failures may significantly hinder the nursing process.[18,19] The development of competency entails systematic practices and continuous reflection, enabling nurses to acknowledge and refine their own communicative style during training.

Adult learning is often understood as a contextualized process that facilitates the flow of thought and the practical application of acquired concepts.[20,21] In nursing education, this perspective is essential, as adult students tend to learn more effectively when they recognize the relevance and immediate applicability of the content to their future professional practice.

In addition, CS enables the identification and analysis of cognitive mistakes, such as anchoring, early closing, and search satisfaction, which are common phenomena among less experienced professionals, allowing students to recognize their own reasoning biases and develop strategies to reduce them.[22] That approach strengthens clinical reasoning and builds reflective and safe practices.

However, the effectiveness of the simulation was closely correlated with the scenario adequacy of the participants' profiles. It is fundamental that the simulated situations fit the students' previous level of knowledge and the current context to promote compatible challenges to their educational level and prevent frustration, which may hinder learning.[23] The balance between complexity and scenario accessibility enhances engagement and fosters meaningful learning.

From a broader perspective, CS should be understood as a complex learning process that involves multiple cognitive aspects. Among these are attention,[24] verbal and non-verbal language,[25] clinical reasoning,[26] decision-making,[3] and perception.[27] The development of such dimensions in an integrated way contributes to educating professionals on critical thinking, clear communication, and safe grounded actions.

Finally, metacognition was highlighted as the central component of meaningful learning. Metacognition, which is enhanced by structured reflective debriefing models,[6] enables students to access and understand their cognitive processes during and after the simulated experience. This self-reflection transforms learning into a lasting experience and integrates knowledge, skills and attitudes into an ongoing cycle of enhancement. By intrinsically understanding how to learn and make decisions, students can refine their practice, become more critical and autonomous, and prepare for the challenges of real care delivery.[28]

CONCLUSION

Simulation is an efficient active teaching and learning methodology in nursing education, strengthening the application of the nursing process steps and the development of competencies through theory-practice integration in realistic scenarios. Thus, future nurses should respond to emerging clinical challenges, such as dengue fever management in primary health care.

However, the effectiveness of simulations depends on overcoming practical and pedagogical shortcomings. The main one is the need for scenario adequacy and fidelity to the students' knowledge level and context

of practice so that learning is meaningful. Moreover, successful simulation depends on the adequate development of the teaching staff, particularly reflective debriefing. Therefore, it is recommended that simulation be integrated into the nursing curriculum in a systematic and cross-sectional manner, focusing increasingly on the complexity of the nursing process and clinical reasoning.

DATA AVAILABILITY

All data supporting the findings of the study are included in the manuscript.

AUTHORS' CONTRIBUTION

Thais Lazaroto Roberto Cordeiro: conception and design of the study, development of the research project, data collection, data analysis and interpretation, drafting of the manuscript, critical revision of the intellectual content, and approval of the final version of the article. Marcia Bucco: conception and design of the study, development of the research project, data collection, data analysis and interpretation, drafting of the manuscript, critical revision of intellectual content, and approval of the final version of the article. Karin Rosa Persegona Ogradowski contributed to the writing of the conclusion and specific sections of the manuscript, participated in the discussion of the results, text revision, and approved the final version of the article. Karyna Turra Osternack: critical revision of the manuscript for clarity and textual coherence and approval of the final version of the article.

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