

Validation of a simulated scenario: identification and management of neonatal jaundice associated with gestational diabetes mellitus

Validação de cenário simulado: identificação e manejo de icterícia neonatal associada ao *diabetes mellitus* gestacional

Validación de un escenario simulado: identificación y manejo de la ictericia neonatal asociada a la diabetes mellitus gestacional

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Abstract

Objective: To construct and validate a simulated scenario on the identification and management of neonatal jaundice as a complication of gestational diabetes mellitus. **Method:** A methodological study, developed between August 2024 and June 2025, in five stages (Overview, Scenario, Scenario Design/Progression, Debriefing, and Assessment) according to the recommendations of the International Nursing Association for Clinical Simulation and Learning, with the participation of 12 volunteers (3 actors, 2 students, 6 experts, and 1 facilitator professor). The experts performed a critical analysis to validate the scenario. The Content Validity Index (CVI) was calculated, considering a minimum acceptable value of 0.78. **Results:** The developed scenario, of low complexity and medium fidelity, addresses the professional posture, knowledge, and clinical reasoning of nursing students. A CVI of 0.98 was obtained. **Conclusion:** The constructed scenario was validated by experts, and it is expected that the publication of this learning tool will contribute to the qualification of nursing care in Brazil.

Descriptors: Neonatal Nursing; Diabetes, Gestational; Hyperbilirubinemia, Neonatal; Education, Nursing; Simulation Training

Resumo

Objetivo: construir e validar um cenário simulado sobre identificação e manejo de icterícia neonatal como complicação do *diabetes mellitus* gestacional. **Método:** estudo metodológico, desenvolvido entre agosto de 2024 e junho de 2025, em cinco etapas (*Overview, Scenario, Scenario Design/Progression, Debriefing e Assessment*) conforme recomendações da *International Nursing Association for Clinical Simulation and Learning*, com participação de 12 voluntários (3 atores, 2 alunos, 6 especialistas e 1 docente facilitador). Os especialistas fizeram análise crítica para

validação do cenário. Calculou-se o Índice de Validade de Conteúdo (IVC), considerando como valor mínimo aceitável de 0,78. **Resultados:** o cenário desenvolvido, de baixa complexidade e média fidelidade, trabalha postura profissional, conhecimento e raciocínio clínico dos estudantes de enfermagem. Obteve-se um IVC de 0,98. **Conclusão:** o cenário construído foi validado por especialistas, e se espera que a publicação dessa ferramenta de aprendizado contribua para a qualificação da assistência de enfermagem no Brasil

Descritores: Enfermagem Neonatal; Diabetes Gestacional; Hiperbilirrubinemia Neonatal; Educação em Enfermagem; Treinamento por Simulação

Resumen

Objetivo: Construir y validar un escenario simulado sobre la identificación y el manejo de la ictericia neonatal como complicación de la diabetes mellitus gestacional. **Método:** Estudio metodológico desarrollado entre agosto de 2024 y junio de 2025, en cinco etapas (Introducción, Escenario, Diseño/Progresión del Escenario, Análisis y Evaluación) según las recomendaciones de la Asociación Internacional de Enfermería para la Simulación Clínica y el Aprendizaje, con la participación de 12 voluntarios (3 actores, 2 estudiantes, 6 especialistas y 1 docente facilitador). Los especialistas realizaron un análisis crítico para validar el escenario. Se calculó el Índice de Validez de Contenido (IVC), considerando un valor mínimo aceptable de 0,78. **Resultados:** El escenario desarrollado, de baja complejidad y fidelidad media, aborda la postura profesional, el conocimiento y el razonamiento clínico de los estudiantes de enfermería. Se obtuvo un IVC de 0,98. **Conclusión:** El escenario construido fue validado por especialistas y se espera que la publicación de esta herramienta de aprendizaje contribuya a la cualificación de la atención de enfermería en Brasil.

Descriptores: Enfermería Neonatal; Diabetes Gestacional; Hiperbilirrubinemia Neonatal; Educación en Enfermería; Entrenamiento Simulado

Introduction

In Brazil, in 2024, there were approximately 332,011.60 live births affected by maternal hyperglycemia during pregnancy, with a prevalence of gestational *diabetes mellitus* (GDM) of 11.1% across all pregnancies.¹ Recognized as a significant factor in the global diabetes pandemic, GDM is associated with increased risks of maternal complications, such as polyhydramnios, hypertensive episodes during pregnancy, and an increased risk of developing diabetes later in life; as well as fetal complications, such as macrosomia, hyperbilirubinemia, and an increased risk of developing metabolic syndrome in the future.²⁻³

The hyperglycemia characteristic of GDM is associated with a sequence of alterations that predispose the fetus to the risk of complications, namely: placental leptin production, adipocyte hypertrophy, increased production of resident macrophages in adipose tissue, excessive hepatic glucose production (gluconeogenesis), placental secretion of insulin counterregulatory hormones

(prolactin, cortisol, human chorionic gonadotropin, chorionic somatotrophic hormone, progesterone, and estrogen), and oxidative stress.⁴⁻⁶

Thus, although fetal macrosomia is the most common fetal complication, neonatal hyperbilirubinemia is also very frequent in newborns (NBs) of pregnant women with GDM. Furthermore, because neonatal hyperbilirubinemia has multiple causes, healthcare professionals do not always pay attention to its relationship with GDM.⁵

The study of pathophysiology reveals that maternal hyperglycemia leads to a state of fetal hyperinsulinism, which increases the metabolic rate. Consequently, oxygen demand rises and may result in tissue hypoxia, stimulating fetal erythropoiesis and potentially leading to polycythemia. At birth, the breakdown of red blood cells is stimulated in order to restore normal blood cell levels in the newborn. In addition, with a higher concentration of red blood cells, blood flow becomes slower and hemolysis is intensified. This process increases fetal bilirubin levels, since bilirubin is one of the products resulting from cellular degradation, and the newborn may present the clinical condition of neonatal hyperbilirubinemia.⁵

To diagnose neonatal hyperbilirubinemia, serum bilirubin levels must be measured and clinical manifestations analyzed, such as yellow discoloration of the skin, sclera, and mucous membranes. Treatment is carried out using phototherapy, which acts on bilirubin degradation through the exposure of a large area of the newborn's skin surface to light energy. When absorbed by the skin, this light converts unconjugated bilirubin into more soluble forms, facilitating its excretion.⁷⁻⁸

The role of nurses in all healthcare settings involving pregnant women, postpartum women, and newborns should be highlighted, as well as the importance of professional qualification for the early recognition of jaundice, clinical assessment, preparation of the newborn for treatment, and implementation of specific care related to phototherapy, such as eye protection with radiopaque coverings, body exposure, temperature monitoring, and proper distance and positioning of the light source. This also includes care planning, interventions outlined in the care plan, and support for the family during treatment. To achieve this, nurses should, through the implementation of the Nursing Process—which encompasses physical examination, establishment of nursing diagnoses, care planning, and evaluation of achieved

outcomes—provide evidence-based, organized, and safe care to the newborn. In this way, further complications resulting from hyperbilirubinemia, prolonged hospitalization, and irreversible neurological sequelae can be avoided, in addition to preventing costs for families and the State.^{7,9}

Therefore, the relevance of teaching physiology, conditions, and therapeutic approaches related to neonatal complications associated with GDM—especially fetal macrosomia and neonatal hyperbilirubinemia—in undergraduate health profession programs should be emphasized. For this purpose, learning through realistic simulation scenarios is capable of encouraging students to develop skills and clinical reasoning through practice in a controlled environment, while also enhancing knowledge synthesis and improving students' psychomotor and affective performance.¹⁰

Although the use of simulated scenarios for nursing students' learning is positive in contributing to safe, qualified, and harm-free care, and this is already well-established knowledge in the literature, no publications were found that address simulation with a clinical case on neonatal jaundice as a complication of gestational diabetes mellitus (GDM). Therefore, the objective was to construct and validate a simulated scenario on the identification and management of neonatal jaundice as a complication of gestational *diabetes mellitus*.

Method

This is a methodological study consisting of five stages: Overview, Scenario, Scenario Design/Progression, Debriefing, and Assessment, based on the recommendations of the International Nursing Association for Clinical Simulation and Learning (INACSL), an association dedicated to improving patient care safety through high-quality simulations.¹¹⁻¹² The first four stages pertain to scenario development, while the fifth stage pertains to the validation process. The study was conducted from August 2024 to June 2025.

The first stage, Overview, was carried out through a general assessment of the scenario construction. In this stage, the following elements were defined: the proposed theme, scenario complexity and fidelity, target audience, duration, simulation modality, number of students required for the functionality of the

scenario, learning objectives, organizational needs, theoretical framework, and the target audience's prior knowledge.

Subsequently, the Scenario stage was conducted, focusing on the development of the scenario based on the theoretical and scientific framework. In this stage, both concise and comprehensive descriptions of the scenario were defined, including clinical data and sociodemographic characteristics of the characters.

In the following stage, Scenario Design/Progression, the scenario event plan was established, including the sequence of events that should occur before the simulation begins, as well as guidance provided to participants regarding all phases of the scenario, learning objectives, script, materials used for setting up the environment, and timing.

Next, during the Debriefing stage, a checklist of the skills and knowledge expected from the students was developed, divided into three main areas to be assessed: attitude, knowledge and clinical reasoning, and guidance. Suggestions of questions for the professor/facilitator were also elaborated.

Finally, the Assessment stage was carried out, consisting of the validation of the scenario and its checklist by experts, who were expert nurses in the field. For this validation, a simulation of the scenario was conducted on June 6, 2025, encompassing all of its stages. The activity took place in a Skills and Care Simulation Laboratory at a Federal University located in the western region of the Federal District. At this stage, 12 volunteers residing in the Federal District participated, including five nursing students (three acting as actors and two as students inserted into the scenario), six experts, and one facilitator professor. The experts analyzed all documents produced during the first four stages and observed the scenario simulation as a teaching activity. Thus, it was possible to assess whether the scenario and its checklist were appropriate for the learning objectives. The actors performed the roles within the scenario, the students participated as learners inserted into the scenario, the experts observed and evaluated the scenario, and the facilitator participated in the activity as the teaching facilitator.

The inclusion criterion established for nursing students was having completed and passed the women's health care course during their undergraduate

nursing education. No exclusion criteria were applied to these volunteers.

The selection of experts was based on the analysis of expertise through the Lattes Curriculum and completion of the adapted scoring system for experts selection,¹³ requiring a minimum score of four points for inclusion. Regarding the exclusion criterion for experts, professionals who had not been directly involved in clinical practice in the area for two years or more were excluded. However, no specialists were excluded from the sample.

The analysis conducted by the experts was based on the completion of 19 items (Table 3) on a Likert scale, which could be classified as "Totally inadequate", "Inadequate, but can be revised", "Adequate with minor adjustments", and "Totally adequate". After compiling the items using Microsoft Excel, the Content Validity Index (CVI) was calculated. The number of responses classified as "Adequate with minor adjustments" and "Totally adequate" was divided by the total number of experts in order to calculate the CVI and validate the scenario. According to the scientific literature, the minimum acceptable CVI value for a panel of six or more experts is 0.78 or higher.¹⁴

This research project is part of an umbrella project entitled "Construction and validation of scenarios for simulation in maternal and child health for teaching in the undergraduate nursing course," which was approved under opinion number 03107418.5.0000.8093 by the Research Ethics Committee of the University of Brasília, Ceilândia College, on December 21, 2018, following the precepts of Resolution number 466/2012 of the National Health Council.

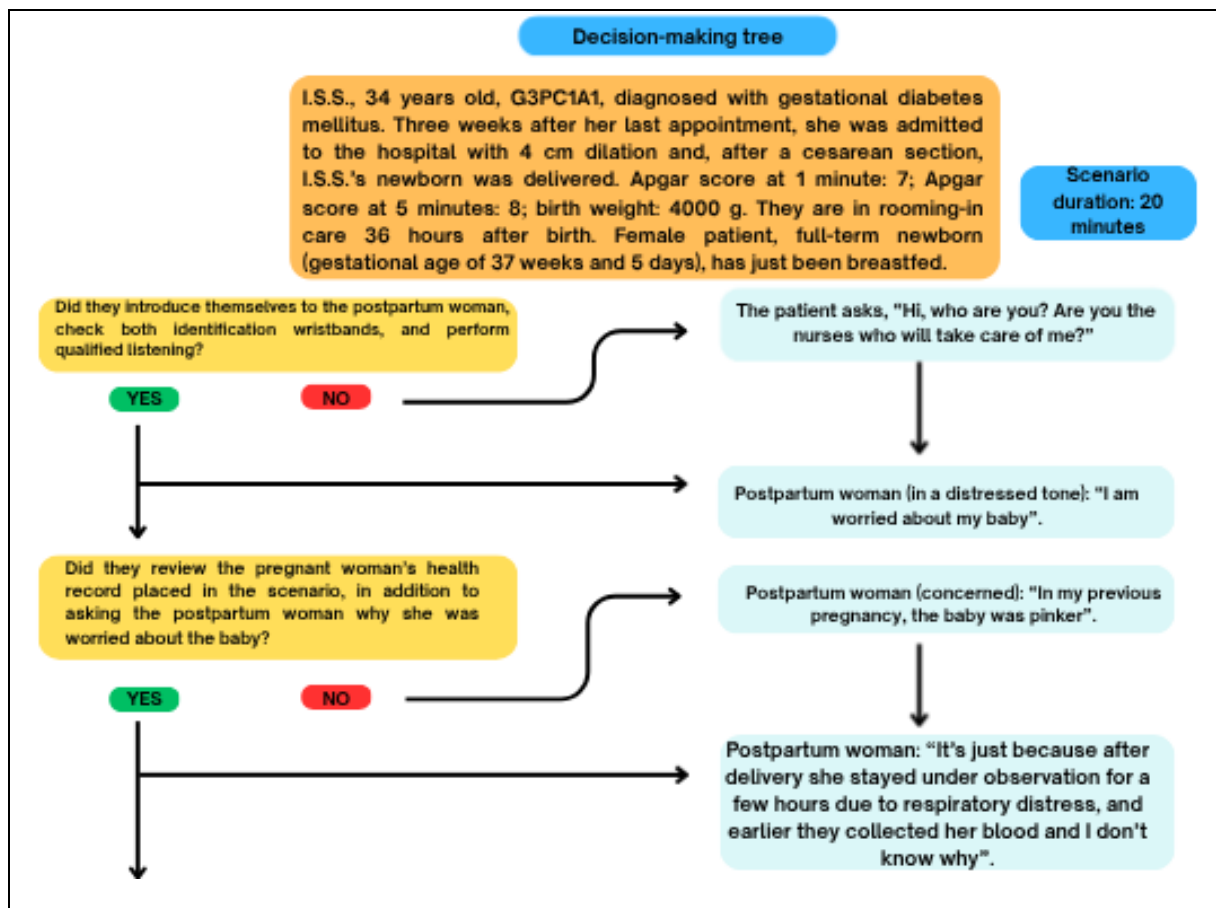
Results

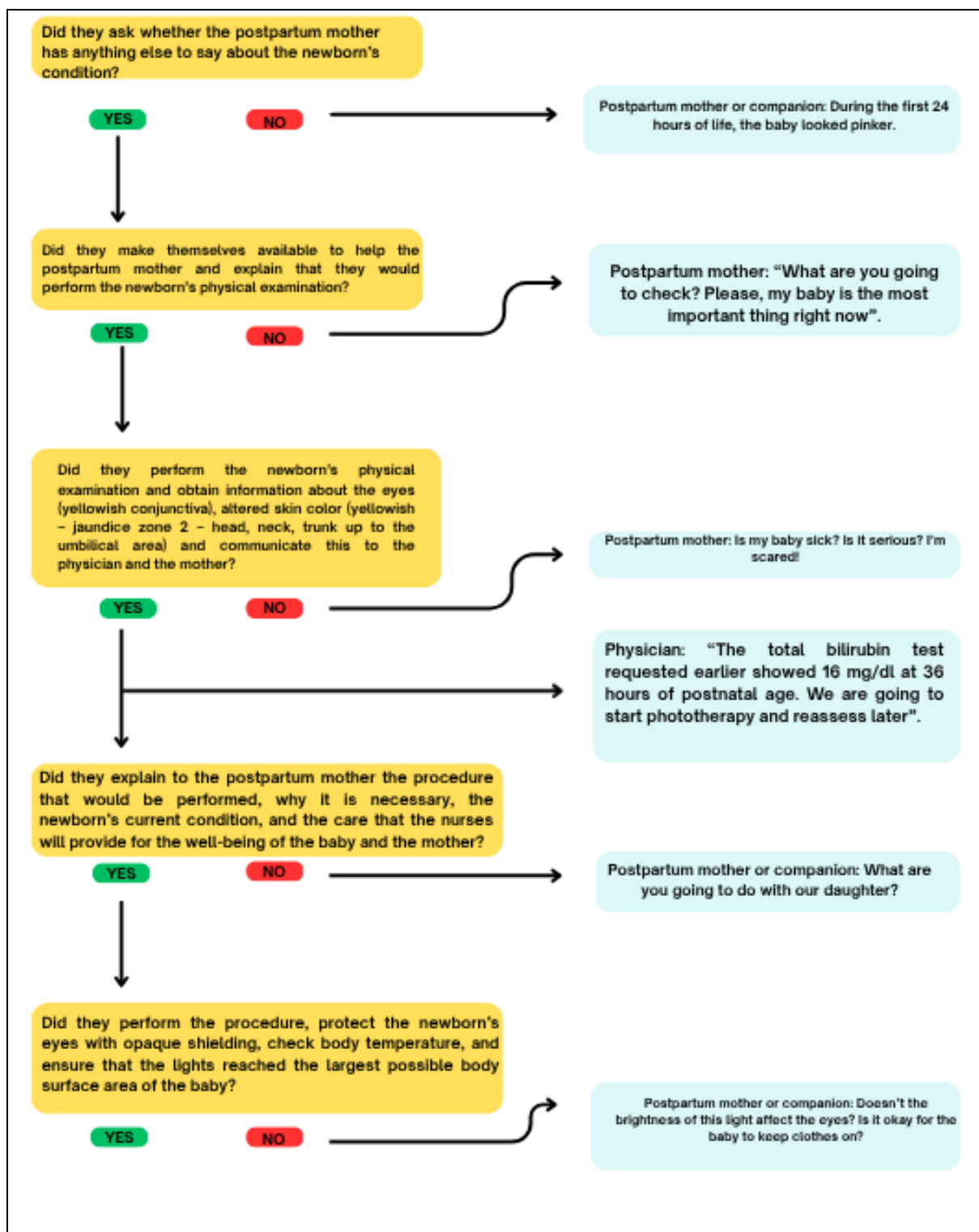
The first four stages of the study were based on extensive reading of the literature in scientific databases on the subject. Publications were sought on the topics of gestational diabetes mellitus, neonatal complications associated with GDM, and the role of nurses in the management of neonatal hyperbilirubinemia. Current manuals from the Brazilian Ministry of Health were consulted, as well as scientific articles available in databases such as PubMed and the Virtual Health Library. Based on this content, the learning objective of the scenario was

established to assess students' knowledge about the management of neonatal hyperbilirubinemia and its recognition, as well as fetal macrosomia, as consequences of GDM, as well as to develop clinical reasoning and how to promote active family participation in the process. This scenario was classified as low complexity and medium fidelity, considering that it is a scenario where the mannequin representing the newborn could not undergo changes in skin color. Box 1 contains information about the validated scenario.

Box 1 – Description of the validated scenario for the identification and management of neonatal jaundice associated with gestational diabetes mellitus. Brasília, Federal District, Brazil, 2025

Title: Identification and management of neonatal jaundice associated with gestational <i>diabetes mellitus</i>	
Complexity: Low	Fidelity: Medium
Scenario duration: up to 45 minutes	Modality: Hybrid simulation
Number of volunteers involved in the scenario: five (three actors and two students for performance).	
Simulated environment: rooming-in • Furniture and decoration: a stretcher; a crib; a side table; a chair; an IV stand; a regular trash can; an infectious waste container; a privacy screen; a sharps container; a phototherapy unit; a hospital acrylic crib; printed protocols. • Medical-hospital equipment: a sphygmomanometer; a digital thermometer; a stethoscope; a measuring tape; a baby scale; a box of procedure gloves; a bottle of 70% alcohol; a 500ml saline solution; a pair of radiopaque protective glasses; two packages of gauze; a package of diapers; adhesive tape. • Documents: pregnant woman's booklet; child's booklet; newborn's prescription; newborn's medical record. Mannequins: newborn doll	
Learning objectives: to assess students' ability to recognize and manage cases of neonatal hyperbilirubinemia, as well as to develop clinical reasoning by associating the condition with maternal gestational diabetes and the interpersonal relationship between the nurse, the patient, and her family.	
Brief description of the clinical case: I.S.S., 34 years old, G3P1C1A1, married, diagnosed with gestational <i>diabetes mellitus</i> during prenatal care at the reference Primary Health Unit. Three weeks after her last appointment, she was admitted to the hospital with 4 cm of dilation and, after a cesarean section due to arrest of progress, the newborn was born with an Apgar score of 7 at 1 minute and 8 at 5 minutes, weighing 4000 g at birth. They are in the same room, 36 hours after birth. The newborn is full-term (gestational age of 37 weeks and 5 days), female, and has just been breastfed. The postpartum woman, already assessed by the nurse, is in good general condition, without complaints.	
Summary script: At the start of the scenario, the postpartum woman is lying next to her newborn daughter. Figure 1 shows the decision-making flowchart, which includes dialogue from the actors present in the scenario and expected student behaviors.	





To conduct a standardized assessment of the students, the observed behaviors were scored using an evaluation checklist (Box 2), created according to the proposed learning objectives. The highlighted skills are classified as priorities.

Box 2 - Evaluation checklist for simulation. Brasília, Federal District, Brazil, 2025

Checklist of skills and knowledge expected of students.				
	N P	I	PA	A
Posture				
They introduced themselves to the postpartum woman, stating their names, roles in the unit, and readiness for the service provided.				
They confirmed the name on the identification bracelet, the postpartum woman's date of birth, and the newborn's bracelet.				
They assured the postpartum woman and the newborn of harm-free nursing care.				
They provided attentive listening and support during all interactions with the postpartum woman in the setting.				
They demonstrated professional conduct and work organization during the setting.				
They demonstrated confidence and professional ability to resolve problems.				
They demonstrated theoretical knowledge about the case.				
Clinical knowledge and reasoning				
They inspected and analyzed the pregnant woman's record, observing the recorded clinical data.				
They analyzed the theoretical-practical relationship between overweight, gestational diabetes mellitus, and perinatal complications (macrosomia, respiratory distress, and hyperbilirubinemia).				
They recognized the complications associated with GDM (macrosomia and hyperbilirubinemia).				
They explained to the patient the fetal complications associated with gestational diabetes mellitus that the newborn presented.				
They performed asepsis or hand washing before starting the physical examination of the newborn.				
They used personal protective equipment.				
During the physical examination, they performed a general inspection and identified yellowish conjunctiva and altered skin color in the newborn.				
During the physical examination, upon identifying an alteration in skin color from the head to the navel, they related it to the type of jaundice zone in the newborn (Zone 2).				
Before performing the physical examination, they provided warmth to the newborn.				
During the physical examination, during the inspection, they identified a state of light sleep in the newborn.				
During the physical examination, they performed palpation of the fontanelles.				
During the physical examination, they performed pulmonary and cardiac auscultation.				
During the physical examination, they identified a respiratory pattern without alterations.				
During the physical examination, they performed abdominal palpation.				

During the physical examination, they performed an evaluation of the genitalia.				
During the physical examination, they performed the Moro reflex.				
During the physical examination, they performed the sucking reflex				
During the physical examination, they performed the fencer's reflex.				
During the physical examination, they performed the Ortolani and Barlow maneuvers.				
During the physical examination, they performed the asphyxia escape reflex.				
During the physical examination, they performed the palmar and plantar pressure reflex test.				
They practiced the development of the Nursing Process (Nursing Assessment, Nursing Diagnosis, Nursing Planning, Nursing Implementation, and Nursing Evolution).				
During the phototherapy procedure, they checked the body temperature.				
During the phototherapy procedure, they positioned the newborn at an appropriate distance from the light source.				
During the phototherapy procedure, they undressed the newborn to better utilize the light source.				
During the phototherapy procedure, they protected the newborn's eyes with a radiopaque covering.				
They performed a physical examination of the postpartum woman.				
Guidelines				
They provided guidance on the procedure to be performed initially (physical examination of the newborn).				
They explained the newborn's condition of neonatal jaundice and briefly and simply explained why it can occur in babies.				
They provided guidance on the phototherapy treatment to be performed, its purpose, and the care required for the newborn.				
They provided guidance on the use of ferrous sulfate until the baby is 3 months old, due to the lack of recorded appointments on the pregnant woman's card.				
Note: NP = not performed; I = inadequate; PA = partially adequate; A = adequate; GDM: gestational <i>diabetes mellitus</i> ; NB: newborn.				

For the selection of experts who acted as experts in the study, evaluating the elaborated scenario, a scoring system for experts was implemented, in which a score related to the expert's training and professional experience was assigned. To be admitted to the study, experts needed to obtain at least four points. Table 1 shows the scores of the six experts.

Table 1 -Expert Scores. Brasília, 2025

Description of scored items	Score	Experts					
		1	2	3	4	5	6
Professional training	1	0	0	0	0	0	0
Post-PhD in Nursing							
PhD in Nursing	1	0	0	0	0	0	0
Master's in Nursing	1	0	1	0	0	1	0
Specialization in Nursing	1	1	1	1	1	0	1
Specialist in Maternal and Child Care	1	1	1	1	1	0	1
Professional Experience in Healthcare							
Hospital Area: Gynecological and Obstetrical Emergency and Urgent Care	2	0	0	2	2	0	2
Hospital Area: Obstetric Center or Rooming-In Unit	2	2	2	2	2	2	2
Primary Care: Prenatal Care	2	2	2	2	2	0	0
Professional Teaching Experience							
Hospital Area: Gynecological and Obstetrical Emergency and Urgent Care	2	0	0	0	2	0	2
Hospital Area: Obstetric Center or Rooming-In Unit	2	0	0	0	2	2	2
Primary Care: Prenatal Care	2	0	0	0	2	0	0
Research Development/Guidance							
Nursing in Gynecological and Obstetrical Emergency and Urgent Care.	2	0	0	0	0	0	0
Nursing in Maternal and Child Health (Women's Health, Neonatology or Pediatrics).	2	0	0	2	2	2	0
Simulation in Nursing Education	2	0	0	2	0	0	0
Publication							
Article, book or chapter on nursing care in maternal and child health (Women's Health, Neonatology or Pediatrics).	2	0	0	2	2	2	2
Article, book or chapter on simulation in nursing education.	2	0	0	2	0	2	0
Total		6	7	1	18	1	1
				6		1	2

Based on information obtained from the curriculum available on the Lattes® Platform and from completing an instrument on the day of scenario validation, it was possible to create a table characterizing the experts (Table 2). It is noted that the body of experts was composed of nurses with graduate degrees at the specialization or master's level, working in care, and some also in teaching and with some type of experience with clinical simulation in nursing in various roles. It should be noted that, in the sum of graduate degrees, a value higher than the total sample of experts is obtained, since one of them had both a specialization and a master's degree. In the item about the type of experience with clinical simulation, the experts could mark more than one alternative.

Table 2 – Characterization of the study experts. Brasília, 2025

	N	%
Age (years)*		37 ± 9.29
Education	6	100.00
Bachelor's Degree in Nursing		
Graduate Degrees		
Specialization	5	83.35
Master's Degree	2	33.34
Professional Experience		
Assistance	6	100.00
Teaching	4	66.66
Years of Experience (years) §		8.5 (5.25 – 19)
Experience with Simulation		
Teacher	2	33.34
Researcher	2	33.34
Providing training on the topic	3	50.00
Previous participation as a judge	4	66.66
Student	4	66.66
Publications in the area of Women's Health	5	83.35
Publications on Realistic Simulation	2	33.34

*Values expressed as mean ± standard deviation

§Values expressed as median and interquartile range

In the validation stage, before the scenario dramatization, the experts received for analysis the documentation produced in all previous stages of the method, that is, the complete information of the scenario such as: duration, classification, description of the clinical case, script, description of the environment, list of materials needed for assembly and checklist. They analyzed all the reasoning of the researchers in the elaboration of the scenario, as well as what was developed in each stage.

After this document analysis, the scenario dramatization proceeded, with a mean duration of 65 minutes. During the first 5 minutes, there was a presentation of the clinical case and the scenario to the nursing students who participated as students inserted in the scenario (pre-briefing). At the beginning of the scenario, 20 minutes were made available for the development of the clinical simulation and, subsequently, 20 minutes for the dramatization of the debriefing.

After the debriefing dramatization was completed, the experts first filled out the evaluation instrument, and then a dialogue was opened between the researchers and the experts so that they could present their evaluation and propose improvements to the scenario. A speaking time of up to 10 minutes was provided for each. In this way, it was possible to understand and make the modifications in a more assertive way.

The data obtained from the completion of the evaluation instrument by the experts formed the basis for the calculation of the CVI (Table 3). For the calculation, the responses to the alternatives "Totally adequate" and "Adequate, with minor adjustments" were considered.

The items that received responses other than "Totally adequate" were reviewed based on the experts' evaluation, and some suggestions were implemented in the scenario, in the decision-making flowchart, and/or in the debriefing skills and knowledge checklist. At the end of the analysis, a mean CVI of 0.98 was obtained.

Table 3 – Expert assessment of the validated simulated scenario. Brasília, 2025

Evaluated items	Totally inadequate		Inadequate, but it can be revised.		Adequate with minor adjustments		Totally adequate		CVI
	n	%	n	%	n	%	n	%	
Clinical Case Plausibility	-	-	1	16.67	1	16.67	4	66.66	0.83
Realism of the Scenario	-	-	-	-	2	33.34	4	66.66	1.0
Adherence to available scientific evidence	-	-	-	-	2	33.34	4	66.66	1.0
Complexity of the Scenario in Relation to the Student's Level of Knowledge and Skills	-	-	-	-	3	50.00	3	50.00	1.0
Clinical Case Description	-	-	1	16.67	3	50.00	2	33.34	0.83
Information provided to the student before the Simulation	-	-	-	-	2	33.34	4	66.66	1.0
Data provided to the student during the simulation	-	-	-	-	2	33.34	4	66.66	1.0
Support provided to the student during the Simulation (Decision Tree)	-	-	-	-	4	66.66	2	33.34	1.0
Learning Objectives	-	-	-	-	3	50.00	3	50.00	1.0
Promotion of Critical Thinking	-	-	-	-	1	16.67	5	83.35	1.0
Promotion of the ability to prioritize nursing assessments and interventions	-	-	-	-	3	50.00	3	50.00	1.0
Promotion of autonomous problem solving	-	-	-	-	1	16.67	5	83.35	1.0
Suitability of the simulator or defined actors for the scenario	-	-	-	-	2	33.34	4	66.66	1.0
Simulator/actor parameters consistent with the clinical case	-	-	-	-	3	50.00	3	50.00	1.0
Simulated environment	-	-	-	-	2	33.34	4	66.66	1.0
Materials and equipment available to students	-	-	-	-	3	50.00	3	50.00	1.0
Aspects evaluated in the debriefing (checklist)	-	-	-	-	-	-	6	100.00	1.0
Reflection and analysis of actions in the debriefing based on the checklist	-	-	-	-	-	-	6	100.00	1.0
Synthesis and feedback to the student in the debriefing based on the checklist	-	-	-	-	1	16.67	5	83.35	1.0
Medium CVI									0.98

After the debriefing, the experts proposed minor changes to the scenario during the dialogue between experts and researchers, based on the items evaluated in Table 3. Concerning the items "Description of the clinical case", "Information provided to the student before the simulation", and "Promotion of the ability to prioritize nursing assessments and interventions", additional information was included in the brief scenario description (indication for cesarean section and information that the postpartum woman had already been assessed by a nurse and was doing well). In the full scenario description, information was added indicating that the postpartum woman noticed differences in the newborn's skin color compared to her first child, whose skin had been rosier. In the script, a line was added for this actor addressing the issue.

Still regarding the description of the clinical case, in response to the items "Data provided to the student during the simulation", "Promotion of the ability to prioritize nursing assessments and interventions", "Promotion of autonomous problem-solving", and "Promotion of critical thinking", details were added about the current delivery, the postpartum woman's condition at the beginning of the scenario, the type of difference noticed in the newborn's skin color, the number of prenatal visits, the frequency of these visits after the diagnosis of GDM, and more detailed statements by the postpartum woman, in order to provide better guidance for students participating in the simulation.

Regarding the item "Learning objectives", the second objective was modified from "Practice the nurse's role in managing the most common neonatal complications in newborns of mothers diagnosed with GDM through a humanized approach" to "Exercise clinical reasoning and relate the neonatal complications presented by the newborn (fetal macrosomia, respiratory dysfunction, and neonatal hyperbilirubinemia) to maternal GDM".

In the Decision-Making Tree, changes were made to one of the postpartum woman's statements in order to make it clearer to students that she had noticed changes in the newborn's skin color, rather than making a generic statement that the baby would be different from her first child (as previously stated). In the postpartum woman's statement regarding a previous examination performed on the newborn before the beginning of the scenario, it was clarified that this was a blood test, so that students would pay attention to the need to obtain the bilirubin test results from the

medical records or the hospital laboratory. In the script, a statement was added to make it clear to students that the newborn did not present jaundice within the first 24 hours of life, in order to avoid confusion regarding the etiology of the jaundice. These modifications address the items "Plausibility of the clinical case," "Adherence to the available scientific evidence," "Data provided to the student during the simulation," "Support provided to the student during the simulation (Decision-Making Tree)", "Simulator/actor parameters consistent with the clinical case", and "Promotion of autonomous problem-solving".

In the materials list, under the item "Furniture/decor," some protocols were added which, according to the experts' recommendations, should be permanently displayed on the walls of the environment, as commonly seen in healthcare units, namely: a table to assess weight adequacy according to gestational age; a figure depicting the classification of jaundice according to body zones; and a graph relating serum bilirubin levels to the need for phototherapy. This modification addresses the items "Realism of the scenario", "Promotion of critical thinking", "Simulated environment", and "Materials and equipment available to students".

The figure referring to the adequacy of the newborn's weight according to gestational age should be in table format relating the percentiles with "Small for gestational age", "Adequate for gestational age" and "Large for gestational age".¹⁵ Regarding the classification of jaundice, a clear image should be provided according to Kramer's classification, which relates the serum bilirubin level to the affected sites.⁷ As for the graph relating the serum bilirubin level and the need for phototherapy, an image should be produced based on the updated recommendations of the Brazilian Society of Pediatrics.¹⁶

As recommended by the experts, some documents were included in the medical record: prescription, medical and nursing progress notes, and the result of the newborn's bilirubin dosage. These modifications address the items "Plausibility of the clinical case", "Adherence to available scientific evidence", "Complexity of the scenario in relation to the student's level of knowledge and skills", "Suitability of the simulator or actors defined for the scenario" and "Simulator/actor parameters consistent with the clinical case".

In the debriefing instrument, an item on the assessment of the primitive asphyxia escape reflex in the neonatal physical examination was added. This change addresses the item “Synthesis and feedback to the student in the debriefing based on the checklist”.

Discussion

The pregnant state, due to human physiology and the need to provide nutrients for fetal development, favors the manifestation of insulin resistance, due to decreased insulin sensitivity. Persistent hyperglycemia contributes to the condition of gestational diabetes mellitus.⁶⁻⁷ Given the frequency of GDM and its negative repercussions for the health of mothers and babies, undergraduate courses have the responsibility to train competent professionals to attend to these cases. Traditional education, based on the passive transmission of knowledge, is no longer attractive to today's youth. Therefore, initiatives such as the scenario developed in this study represent an advance in professional training.

Considering the vulnerability of the newborn and the nurse's 24-hour-a-day role in patient care, it becomes essential to practice early identification and appropriate clinical management of neonatal hyperbilirubinemia associated with GDM. To this end, the application of active methodologies, such as clinical simulation, allows for the effective association of theory and practice. This methodology, in turn, has been gaining more and more space in higher education nursing institutions, not only because of the trend of replacing the traditional and passive learning method, but also because it allows for the protagonism and active participation of the student, indispensable characteristics for the nursing professional.¹⁷

Given the excess of stimuli to which students are currently exposed, the development of teaching technologies that promote their engagement becomes urgent. Simulation has stood out as a method in which the student is directly involved in the teaching-learning process, in addition to stimulating reflections on behaviors and technical and non-technical skills. By integrating action, emotion, decision-making, and reflection, simulation restores focus to teaching, something that proves challenging for the hyper-connected generation.¹⁸ To achieve its objectives, it is not always necessary to use sophisticated simulators; accessible strategies—such as structured dramatizations

with actors (who can be teachers or trained students), the use of simple materials, handcrafted mannequins, escape rooms designed according to reality, and hybrid simulations—can demonstrate significant results.¹⁸ The scenario developed aligns with this understanding, since it includes materials with a lower technological level, which favors its replication in educational institutions of different economic contexts.

In a study conducted with nursing students at a Brazilian university who used the clinical simulation method for nursing assessment and intervention in emergency clinical cases, a significant increase was observed in students' self-confidence regarding nursing practices and patient safety.¹⁹ Furthermore, another study found that students who used clinical simulation for learning demonstrated better long-term cognitive performance (30 days) compared to those exposed to traditional teaching methodologies.²⁰ The use of simulation has already been considered highly effective in academia; however, when simulation is based on a scenario developed with the methodological rigor proposed by INACSL, it further strengthens the rigor of teaching.

Considering the effectiveness of clinical simulation teaching in nursing, as well as the difficulty in accessing practical training settings involving more vulnerable patients, such as newborns (NBs), the scenario developed in this study becomes an important educational tool to be used in the future. The topic of neonatal hyperbilirubinemia as a consequence of gestational diabetes mellitus (GDM) is still scarcely explored in studies on scenario validation. Most publications on scenario validation focus on nursing care for older adults, specifically trauma care in urgent and emergency contexts and women's health.²¹⁻²⁵

The results of the analysis using the Likert scale indicated a Content Validity Index (CVI) of 0.98, demonstrating that the scenario "Identification and management of neonatal complications associated with gestational diabetes mellitus" is suitable for application in undergraduate nursing education due to the excellence and coherence identified by the experts through the scoring of the items presented in Table 3. The CVI obtained in this study (CVI = 0.98) is consistent with the standards found in the maternal-child health literature, such as management of severe preeclampsia during the puerperium (CVI = 1.0), nursing care in cases of missed abortion (CVI = 0.97), and breastfeeding promotion (CVI = 1.0).²⁶⁻²⁸ No scientific

studies validating simulated scenarios for the management of neonatal complications associated with GDM were identified in the available literature, which motivated the development of the present study.

Once validated, this scenario aims to provide undergraduate nursing educators with a coherent and cohesive instrument, based on scientific evidence, for the development of skills related to maternal-child health in the context of gestational diabetes mellitus, an area that still lacks studies on the construction and validation of simulated scenarios in the available literature.

The importance of professional qualification for nurses working in neonatal care should be emphasized, as newborns represent a vulnerable population. Even full-term newborns are more likely to develop complications related to adaptation to extrauterine life, such as hypothermia, hypoglycemia, hyperbilirubinemia, respiratory dysfunctions, among others.²⁹ Nursing professionals monitor the evolution of newborns while paying close attention to these changes because they are the healthcare team members who remain at the patient's bedside 24 hours a day. Therefore, having a well-qualified nurse may be considered a protective factor for these patients, since some conditions, although considered simple and recurrent, such as hyperbilirubinemia, may cause permanent damage if left untreated.

It should also be noted that untreated neonatal hyperbilirubinemia carries significant risks, as this condition may lead to the development of the neurological complication known as kernicterus, characterized by bilirubin deposition in brain cells, resulting in neural damage and severe motor dysfunctions in the newborn. Therefore, it is essential to train nurses to detect jaundice during physical examination, interpret serum bilirubin levels, and carry out the procedures required for treatment, which, in the simulated scenario, corresponds to phototherapy. In maternity settings, nurses are responsible for setting up the equipment and also serve as a communication bridge with the family, informing them about the treatment, the newborn's health condition, the necessary care, and the neonate's vulnerabilities.⁷⁻⁸ In this context, detecting the

condition while the newborn is still in rooming-in care, as proposed in the scenario, is important to enable earlier treatment and also because many families delay returning for follow-up care at their primary healthcare unit, which may lead to worsening of the neonate's health condition.

During treatment, the relationship between parents and the newborn can become unstable if the healthcare provided is not inclusive, since the imaginary figure of the "ideal baby" is broken, now blindfolded, without the clothes from the much-dreamed-of layette, and exposed to blue light. Therefore, in addition to caring for the newborn in relation to dehydration, hypothermia, hyperthermia, weight loss, and discontinuation of phototherapy, among other aspects, the nurse must offer information in accessible language, space for clarification of doubts, and support, in order to reduce the suffering and anguish of the family, with competence, technical-scientific basis, and humanization.⁶ Therefore, for the training of qualified professionals, the use of the validated scenario is valuable, since, in addition to clinical reasoning, the student exercises the ability to communicate and interact with the patients and their family.

The study has some limitations. The scenario was designed and developed based on scientific evidence, but from the perspective of the health reality of the Federal District. Thus, there may be a need for minor adjustments to the scenario or script, according to other realities in which the teacher may apply this teaching tool. Nursing procedure and conduct protocols may differ depending on the state in which the instrument is applied, which does not prevent specific changes from being made, according to the local reality. It is important to note that, if substantial modifications to the scenario are necessary, the development and validation of a new scenario is recommended.

Thus, it can be stated that the use of simulation as a tool for the teaching-learning process of nursing students presents several advantages, especially the improvement of theoretical and practical skills, with moments dedicated to correcting flaws through dialogues about difficulties in the scenario, to experience in a realistic environment, to interprofessional communication, and to providing safe patient care.^{10,17} In the scenario developed and validated in this study, for example, there is

potential for improving health care competencies, decision-making, communication, leadership, and technical knowledge among nursing students.

Conclusion

The study fulfilled its objective of developing and validating a clinical simulation scenario for the identification and management of neonatal jaundice as a complication of gestational diabetes mellitus. It is considered a safe teaching tool that can contribute to undergraduate nursing education in the area of maternal and child health, promoting the qualification of nursing care. The importance of simulation as a complementary teaching method, and not as a substitute for professional practice directly with the population through internships and other forms of supervised practice, is highlighted.

References

1. International Diabetes Federation. Diabetes Country Report (2000-2050) [Internet]. 2025 [cited 2025 May 11]. Available from: <https://diabetesatlas.org/data-by-location/country/brazil/>.
2. Santos PA, Madi JM, Silva ER, Vergani DO, Araújo BF, Garcia RMR. Gestational diabetes in the population served by Brazilian Public Health Care. Prevalence and risk factors. *Rev Bras Ginecol Obstet*. 2020;42(01):012-8. doi: 10.1055/s-0039-1700797.
3. Zajdenverg L, Façanha CFS, Dualib PM, Golbert A, Moisés ECD, Calderon IMP, et al. Rastreamento e diagnóstico da hiperglicemia na gestação [Internet]. Diretriz SBD 2025. [cited 2026 Feb 11]. doi: 10.29327/557753.2022-11.
4. Zhang Y, Xiao CM, Zhang S, Zhou J. Fasting plasma glucose and fetal ultrasound predict the occurrence of neonatal macrosomia in gestational diabetes mellitus. *BMC Pregnancy Childbirth*. 2023;23(1):269. doi: 10.1186/s12884-023-05594-6.
5. Liu Y, Wang M, Zhou J. Impact of gestational diabetes mellitus on neonatal birth outcomes. *Br J Hosp Med (Lond)*. 2024;85(11):1-12. doi: 10.12968/hmed.2024.0410.
6. Pires HAF, Santos LR, Bomfim BR, Osolins LF, Nemeth MERF, Siqueira YA, et al. Macrosomia fetal decorrente de diabetes na gestação e suas repercussões após o nascimento: aspectos etiopatogênicos, métodos diagnósticos e medidas preventivas. *Braz J Dev*. 2022;8(9):62816-29. doi: 10.34117/bjdv8n9-156.
7. Godoy CD, Silva MMA, Santos TC, Santana CJ, Miranda LL. Icterícia neonatal: atuação do enfermeiro frente à identificação precoce e tratamento. *Res Soc Dev*. 2021;10(15):e386101522765. doi: 10.33448/rsd-v10i15.22765.
8. Confessor MVA, Serra SBS, Costa ABP, Silva ACBC, Souza Júnior NVRS, Santos LG, et al. Hiperbilirrubinemia neonatal: etiopatogênese e manejo. *Aracê* 2025;7(2):7446-62. doi: 10.56238/arev7n2-168.

9. BRASIL. Conselho Federal de Enfermagem. Resolução COFEN nº 736, de 17 de janeiro de 2024. Dispõe sobre a implementação do Processo de Enfermagem em todo contexto socioambiental onde ocorre o cuidado de enfermagem. 2024. Disponível em: <https://www.cofen.gov.br/resolucao-cofen-no-736-de-17-de-janeiro-de-2024/>. Acesso em: 11 maio 2025.
10. Amorim GC, Bernardinelli FCP, Nascimento JSG, Souza IF, Contim D, Chavaglia SRR. Cenários simulados em enfermagem: revisão integrativa de literatura. *Rev Bras Enferm*. 2023;76(1):e20220123. doi: 10.1590/0034-7167-2022-0123.
11. Gilbert M, Adamson KA; Nursing Section Validation Subgroup. Making sense of methods and measurement: validation part II. *Clin Simul Nurs*. 2016;12:275-6. doi: 10.1016/j.ecns.2016.02.006.
12. Lioce L, Meakim CH, Fey MK, Chmil JV, Mariani B, Alinier G. Standards of best practice: simulation standard IX: simulation design. *Clin Simul Nurs*. 2015;11(6):309-15. doi: 10.1016/j.ecns.2015.03.005.
13. Góes FSN, Dalri MCB, Fonseca LMM, Canini SMRS, Scochi CGS. Desenvolvimento de casos clínicos para o ensino do raciocínio diagnóstico. *Rev Eletrônica Enferm*. 2014;16(1):1-9. doi: 10.5216/ree.v16i1.20564.
14. Alexandre NMC, Coluci MZO. Validade de conteúdo nos processos de construção e adaptação de instrumentos de medidas. *Ciênc Saúde Colet*. 2011;16(7):3061-8. doi: 10.1590/S1413-81232011000800006.
15. Guedes RRL, Soares JMA, Pinheiro MB, Fontes JS. Perfil de prematuridade e adequação neonatal de peso em maternidade de Minas Gerais e comparação com literatura médica. *Resid Pediatr*. 2022;12(1):1-8. doi: 10.25060/residpediatr-2022.v12n1-265.
16. Sociedade Brasileira de Pediatria. Hiperbilirrubinemia indireta no período neonatal. Departamento Científico de Neonatologia (2019-2021) [Internet]. Rio de Janeiro (RJ): SBP; 2021 [acesso em 2025 maio 09]. Disponível em: https://www.sbp.com.br/fileadmin/user_upload/23176c-MO_Hiperbilirrubinemia_indireta_periodo_neo.pdf.
17. Domingues I, Martins E, Almeida CL, Silva DA. Contribuições da simulação realística no ensino-aprendizagem da enfermagem: revisão integrativa. *Res Soc Dev*. 2021;10(2):e55710212841. doi: 10.33448/rsd-v10i2.12841.
18. Xavier AT, Cabral JVB, Silveira MMBM. Geração da atenção fragmentada: a simulação no enfrentamento da distração o digital no ensino de enfermagem. *Rev Enferm UFJF*. 2026;12(1):1-3. doi: 10.34019/2446-5739.2026.v12.51134.
19. Bortolato-Major C, Mantovani MF, Felix JVC, Boostel R, Mattei AT, Souza RM, et al. Autoconfiança e satisfação dos estudantes de enfermagem em simulação de emergência. *Rev Min Enferm*. 2020;24:1-7. doi: 10.5935/1415.2762.20200073.
20. Araújo MS, Medeiros SM, Costa RRO, Coutinho VRD, Mazzo A, Sousa YG. Efeito da simulação clínica na retenção do conhecimento de estudantes de enfermagem. *Acta Paul Enferm*. 2021;34:1-8. doi: 10.37689/acta-ape/2021AO000955.
21. Santana ER, Piacuzzi LHV, Lopes MCBT, Batista REA, Vancini-Campanharo CR, Góis AFT. Construção e validação de cenário de simulação de transporte intra-hospitalar. *Einstein (São Paulo)*. 2021;19:eAO5868. doi: 10.31744/einstein_journal/2021AO5868.
22. Santana JCB. Treinamento por simulação e colaboração interprofissional em incidentes com múltiplas vítimas: um relato de experiência. *Inova [Internet]* 2024 [acesso em 2025 maio 11];4(1):16-27. Disponível em: <https://revista.corenmg.gov.br/index.php/inova/article/view/153>.

23. Melo MS, Llapa-Rodriguez EO, Bispo LD, Andrade JS, Barreiro MSC, Resende LT. Construção e validação de simulação clínica sobre testagem e aconselhamento para o HIV em gestantes. *Cogitare Enferm.* 2022;27. doi: 10.5380/ce.v27i0.80433.
24. Pereira K, Silva SCN, Fernandes DS, Viduedo AFS, Leon CGRMP, Ribeiro LM, et al. Manejo da hipertensão gestacional no pré-natal: validação de cenário para a simulação clínica. *Av Enferm.* 2023;41(1):105044. doi: 10.15446/av.enferm.v41n1.105044.
25. Ramos DF, Matos MP, Viduedo AFS, Ribeiro LM, Leon CGRMP, Schardosim JM. Consulta de enfermagem em planejamento reprodutivo: validação de cenário e checklist para o debriefing. *Acta Paul Enferm.* 2022;35:1-10. doi: 10.37689/acta-ape/2022AO0296345.
26. Silva SCN, Alencar BR, Viduedo AFS, Ribeiro LM, Leon CGRMP. Manejo de pré-eclampsia grave no puerpério: validação de cenário para simulação clínica. *Rev Bras Enferm.* 2021;74(6). doi: 10.1590/0034-7167-2020-0445.
27. Matos SS, Fernandes DS, Viduedo AFS, Ribeiro LM, Leon CGRMP, Schardosim JM. Assistência de enfermagem em situação de abortamento retido: cenário validado para simulação clínica. *Enferm Foco.* 2022;13:1-8. doi: 10.21675/2357-707X.2022.v13.e-202236.
28. Natarelli TRP, Campbell SH, Mello DF, Moreno AIP, Fonseca LMM. Cenário simulado para promoção do aleitamento materno na atenção primária à saúde. *Acta Paul Enferm.* 2025;38:1-10. doi: 10.37689/acta-ape/2025AO0002852.
29. Araújo LO, Santana CS, Fiscina ANVS, Silva MF, Rodrigues QP. Fatores associados a hipotermia nos recém-nascidos. *Rev Eletrônica Acervo Saúde.* 2024;24(10):1-12. doi: 10.25248/reas.e17902.2024.

Funding / Acknowledgments: This study was funded by the Research Support Foundation of the Federal District – FAPDF.

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How to cite this article

Moreira JA, Marques Filho CA, Viduedo AFS, Diógenes RRL, Schardosim JM. Validation of a simulated scenario: identification and management of neonatal jaundice associated with gestational diabetes mellitus. Rev. Enferm. UFSM. 2026 [Access at: Year Month Day]; vol.16, e12:1-25. DOI: <https://doi.org/10.5902/2179769294128>