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Original Article

Foreign body airway obstruction: construction and validation of a telesimulated scenario*

Obstrução de vias aéreas por corpo estranho: construção e validação de cenário telessimulado

Obstrucción de las vías respiratorias por cuerpo extraño: construcción y validación de un escenario telesimulado

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Abstract

Objective: to present the process of building and validating a telesimulated scenario on the prevention and management of foreign body airway obstruction in children under one year of age. **Method**: a methodological study, developed in two stages: construction of the scenario based on scientific literature and the Nursing Education Simulation Framework guidelines, and submission to content and appearance validation by experts in the field. The Content Validation Index (CVI) was calculated, considering a value equal to or greater than 0.80 to be appropriate. **Results**: A hybrid scenario was constructed with two simulated participants and a low-fidelity mannequin representing the child, recorded in a simulated house by a team specialized in image and sound, lasting six minutes after editing. Nine experts took part and the items evaluated reached the proposed CVI. **Conclusion**: validated scenario in terms of content and appearance with potential applicability in health education actions.
Descriptors: Nursing; Simulation Training; Airway Obstruction; Child; Caregivers

Resumo

Objetivo: apresentar o processo de construção e validação de um cenário telessimulado sobre prevenção e manejo da obstrução de vias aéreas por corpo estranho em crianças menores de um ano. **Método:** estudo metodológico, desenvolvido em duas etapas: construção do cenário baseada na literatura científica e nas diretrizes do *Nursing Education Simulation Framework* e submissão à validação de conteúdo e aparência por especialistas com expertises na temática. Calculou-se o Índice de Validação de Conteúdo (IVC), considerando adequado valor igual ou superior a 0,80. **Resultados:** foi construído um cenário híbrido com duas participantes simuladas e um manequim de baixa fidelidade representando a criança, gravado numa casa simulada por equipe

especializada em imagem e som, com seis minutos de duração após edição. Nove especialistas participaram e os itens avaliados atingiram IVC proposto. **Conclusão:** cenário validado em conteúdo e aparência com potencial aplicabilidade nas ações de educação em saúde.
Descritores: Enfermagem; Treinamento por Simulação; Obstrução das Vias Respiratórias; Criança; Cuidadores

Resumen

Objetivo: presentar el proceso de construcción y validación de un escenario telesimulado sobre la prevención y manejo de la obstrucción de la vía aérea por cuerpo extraño en niños menores de un año. **Método:** estudio metodológico, desarrollado en dos etapas: construcción del escenario con base en la literatura científica y de las directrices del Marco de Simulación de Educación en Enfermería, y sometimiento a validación de contenido y apariencia por especialistas con experiencia en el tema. Se calculó el Índice de Validación de Contenido (IVC), considerando adecuado un valor igual o mayor a 0,80. **Resultados:** se construyó un escenario híbrido con dos participantes simulados y un maniquí de baja fidelidad que representaba al niño, grabado en una casa simulada por un equipo especializado en imagen y sonido, con una duración de seis minutos después del montaje. Participaron nueve expertos y los ítems evaluados alcanzaron el CVI propuesto. **Conclusión:** escenario validado en cuanto a contenido y apariencia con potencial aplicabilidad en acciones de educación en salud.
Descriptores: Enfermería**;** Entrenamiento Simulado; Obstrucción de las Vías Aéreas; Niño; Cuidadores

Introduction

Domestic accidents that affect children are responsible for high rates of hospitalization and death.[1] Among these, Foreign Body Airway Obstruction (FBOA), popularly known as choking, accounts for 53% of occurrences and can lead to death.

A foreign body is defined as a substance or object that unintentionally hits the body or its cavities, and can be ingested or introduced into the ear canal or nostrils, presenting a greater danger when aspirated into the lungs.[2] A study carried out in China showed that of the 63 choking victims admitted to the Pediatric Intensive Care Unit of a University Hospital, 44% died.[3]

The literature points to a relationship between the prevalence of domestic accidents in children and the COVID-19 pandemic.[4-8] Some studies have concluded that these incidents became more frequent as the time spent in social isolation increased.[5-6] On the other hand, others have identified a reduction in the number of emergency department visits due to these injuries.[7-8] Among the main accidents reported by the media in the state of Mato Grosso do Sul during the pandemic period were drowning, falls, and suffocation.[5]

This scenario has revealed the need to restructure health education strategies to prevent and manage domestic accidents in childhood, allowing family caregivers access

to information even in the face of social restrictions. In this direction, digital information and communication technologies such as telesimulation have become important allies in health education. Telesimulation has become well-known among health students during the pandemic, but it has been explored little by non-professionals.[9-10]

Telesimulation simultaneously integrates the resources of health simulation with digital technologies.[10-11] According to a scoping review that aimed to analyze the concept and applicability of tele-simulation, it is characterized by the provision of simulated educational practices carried out remotely, synchronously, employing a video call.[10]

Given the epidemiological relevance of FBOA accidents and the need for educational actions on the prevention and management of choking among family members, as well as the fact that telesimulation is an educational modality that is little explored among laypeople and has the potential to be disseminated among digital technologies, the aim of this study was to present the process of building and validating a telesimulated scenario on the prevention and management of foreign body airway obstruction in children under one year.

Method

This is a methodological study, developed between February 2020 and September 2021, by researchers in the area of pediatric nursing at a Higher Education Institution in the interior of the state of São Paulo (SP). The construction of the simulation followed the guidelines of the Nursing Education Simulation Framework[12] and was based on national and international scientific evidence on the subject and the authors' previous experience. According to these guidelines, in order to build a simulation, the following steps must be followed: identification of the theme, simulation objectives, participants, prebriefing, scenario, and debriefing process, which will be presented in detail in the results section.

It is important to note that the first version of the template was developed to be an *in situ* simulation, in the homes of mothers of children under the age of one. However, given the COVID-19 pandemic and the consequent restriction of social contact, it was necessary to reorganize the proposal by recording the simulated scenario and then transmitting it as a video during virtual meetings. Thus, the entire content validation process described

corresponds to the first version of the template and took place in February 2020. It is worth noting that no new content validation was carried out on the scenario adapted for telesimulation, as there were no changes to the objectives or content.

Once the scenario had been constructed, we moved on to the content and appearance validation stage. This stage involved the participation of specialists who met the following eligibility criteria: professional specialists in the field of pediatric nursing, with academic and/or care experience in pediatrics, and/or in the area of simulation for at least one year. Recruitment was by convenience, through analysis of CVs on the Lattes Platform.

The validation process took place in person in February 2020, before the World Health Organization declared the COVID-19 pandemic. To this end, a formal invitation was sent by email to 10 potential experts, 9 of whom agreed to take part and showed up on the scheduled date and time.

Initially, the experts responded to a characterization tool organized with data such as date of birth, year of training, degree, professional activity, previous experience with FBOA and simulation, and length of time working. After watching the scenario, they filled in a specific evaluation tool and took part in a focus group, intending to compile opinions, contributions, and proposals about the scenario.[13]

The scenario evaluation tool analyzed the following criteria: plausibility, realism, adherence to available scientific evidence, complexity in relation to the participant's level of knowledge and skills, case summary, educational material used in the Prebriefing, information provided before the simulation, learning objectives, promotion of critical thinking, promotion of autonomous problem solving, simulated environment, materials and equipment available and Debriefing questions. All these aspects were analyzed using a Likert scale with the following response options: inadequate, partially adequate, and adequate. There was also an open field for comments.[14]

The data obtained from the application of the instruments was organized in a Microsoft Excel® spreadsheet. Descriptive statistics were used to analyze the expert characterization data. Based on the results obtained from the scenario-specific evaluation instrument, the Content Validation Index (CVI) was calculated for each aspect analyzed, with a CVI equal to or greater than 0.80 is considered adequate.[15]

Considering the involvement of human beings, the study was submitted to the Research Ethics Committee in compliance with Resolution 510/2016 of the National Research Ethics Committee of the National Health Council and approved on 24/07/2019 under opinion number 3.467.920. All the experts had prior access to the Free and Informed Consent Term for reading and discussion with the researchers, and only after both parties (researcher and experts) had signed it did data collection begin.

Results

To build the telesimulation scenario, the topic chosen was prevention and management of airway clearance in children under one year of age, intending to train family members and caregivers about the main signs and symptoms of choking, the main actions expected in this situation, and preventive measures.

The script was based on the main causes of foreign body airway obstruction in children under one year of age and the respective preventive measures, the signs and symptoms shown by a baby, and the airway clearance maneuver for children up to 12 months of age. The detailed script is shown in Chart 1.

Chart 1 – Script for the telesimulated scenario "Management and prevention of FBOA among children under one year old". São Carlos, SP, Brazil, 2020-2021

Scenario script "Prevention and management of FBOA among children under one year old"
Ana (simulated participant) is visiting her friend Laura (simulated participant) and is taking her 5-month-old baby Pedro with her. Ana arrives with the baby asleep in his baby carriage. During the conversation, the baby wakes up and starts mumbling a "weak cry". To calm him down, the mother offers him a bottle with 180 ml of milk formula, keeping the baby lying in the baby carriage. After feeding, Ana's cell phone rings and she walks away from the scene, leaving her friend alone with the baby. As she leaves, the baby has episodes of coughing, progressing to lip cyanosis. At this point, Laura needs to act quickly to help the baby. Faced with the desperation of the situation and not knowing how to act, Ana and Laura call the Mobile Emergency Care Service (*Serviço de Atendimento Móvel de Urgência* - SAMU) and the team of rescuers advise them on the maneuver to be performed. After the maneuver, the baby regurgitates milk and shows signs of disengagement (crying and no cyanosis). After a few days, Ana returns to her friend's house. She arrives with Pedro in his baby carriage (awake and with the back of the baby carriage tilted). The purpose of the visit is to thank her for her help during the choking episode a few days ago. On the trolley tray, there is a jar with grapes and another with popcorn, as well as some toys with small parts. During the conversation, Ana will offer the food to the baby and encourage him to play.

Considering prebriefing as any orientation, task, or activity designed by the educator that takes place before the scenario is developed, the next step was to establish how this stage would be organized. With this in mind, we selected the "Baby Care" folder produced and distributed free of charge by the non-governmental organization (NGO) *Criança Segura* (Safe Child) and the educational booklet entitled "What to do when your baby chokes?"[16]

As for the scenario, we opted for the hybrid simulation modality, since it involved two simulated participants (the baby's mother and a friend) and a low-fidelity mannequin to represent the baby. To simulate the baby, we used a doll made from soft vinyl and cloth by Cotiplás from the Ninos collection - model 1494. Approximate dimensions: 50x25x13cm and weight relatively similar to that of a 5-month-old child (five kilos). To simulate the sound of crying, coughing, and vomiting, a portable Bluetooth-activated speaker was inserted inside the doll's cloth chest.

As for the physical infrastructure, the scenario took place in a simulated house located on the premises of the educational institution. The entire scenario took place in the house's kitchen. The scenario was recorded and then edited by a team specializing in image and sound. The video produced is six minutes long and is available on restricted access on YouTube. Figures 1 and 2 illustrate some scenes from the set.

Figure 1 – Scene depicting airway clearance after clearance maneuver. São Carlos, SP, Brazil, 2020-2021

Figure 2 – Mannequin representing a baby with lip cyanosis and, below, foods and toys that could potentially cause airway obstruction. São Carlos, SP, Brazil, 2020-2021

The last stage was the planning of the debriefing process, a structured activity that takes place after the scenario has been developed, to provide opportunities for reflection and expression of emotions, as well as consolidating the knowledge intended in the simulation's learning objectives. To this end, the debriefing was structured around the following guiding questions: How did you feel when you watched the simulation video? What feelings came up? Could you describe the scenario you watched? What were the positive points in the performance of the characters Ana and Laura? Would you do anything differently at any point? Do you think that taking part in this activity will help in the event of a possible choking situation with your child?

To make sure that the learning objectives are met, the researchers established a menu to guide the facilitation of the debriefing, in case these aspects are not explored by the participants during the discussion. The debriefing menu is described in Chart 2.

Chart 2 – Debriefing of the telesimulated scenario “Management and prevention of FBOA among children under one year old”. São Carlos, SP, Brazil, 2020-2021

Debriefing menu
1. Definition of foreign body airway obstruction (choking); 2. Difference between partial and total obstruction; 3. Main manifestations of a choking baby; 4. How to perform the airway clearance maneuver; 5. The importance of requesting help from the SAMU if in doubt; 6. Main causes of choking; 7. Prevention measures: **Toys:** choose according to each age group and follow the manufacturer's recommendations; avoid using toys with batteries and detachable and/or broken parts. **Food**: sit the child down to give food; avoid offering round, hard foods such as grapes, raw carrots, popcorn, sweets and peanuts; after feeding, wait for the baby to burp and place them on their stomach.

To validate the content and appearance of the scenario, 9 experts with expertise in the subject were recruited. All were female, with an average age of 35.6 years and an average training period of 10.7 years. In terms of qualifications and area of work, 44.4% had a doctorate and 66.6% worked in teaching. Concerning previous experience, 66.6% responded positively about having teaching and/or care experience in airway obstruction and 100% said they had experience with simulation.

After attending the development of the proposed scenario in person, the experts filled in the scenario evaluation tool. Table 1 shows the absolute and relative numbers for each item evaluated and the CVI value. It can be seen that all the items reached a CVI greater than or equal to 0.80, considering the scenario validated in terms of content and appearance. Regardless of the positive assessment, during the focus group, some suggestions for improving the realism of the scenario were discussed and incorporated into the final version of the scenario. Among the suggestions was the inclusion of liquid content in the mannequin's oral cavity, in order to simulate the outflow of milk after maneuvers.

Table 1 - Assessment of the items for validating the content and appearance of the telesimulated scenario, according to the experts (n=9). São Carlos, SP, Brazil, 2020-2021

Items	Adequate	Partially Adequate	Inadequate	CVI
Plausibility of the clinical case	9	-	-	1,00
Realism	7	2	-	0,80
Adherence to available scientific evidence	9	-	-	1,00
Complexity in relation to the participant's level of knowledge and skills	8	1	-	0,90
Summary of the case	9	-	-	1,00
Objectives of the simulation	8	1	-	0,90
Educational material used in the Prebriefing	9	-	-	1,00
Information provided to the participant before the simulation	8	1	-	0,90
Learning objectives	9	-	-	1,00
Promoting critical thinking	9	-	-	1,00
Promotion of autonomous problem-solving	9	-	-	1,00
Simulated environment	9	-	-	1,00
Materials and equipment available	9	-	-	1,00
Debriefing questions	8	1	-	0,90

Discussion

Education and training strategies have undergone changes during the COVID-19 pandemic and consequent social restrictions, requiring the identification and evaluation of learning proposals. In this way, telesimulation comes into play as a distance education tool, providing remote and easily accessible training options. In telesimulation, the objectives focus on developing cognitive and behavioral skills, since those involved do not have the opportunity to practice technical skills.[17]

Studies have been carried out applying the telesimulation proposal to various topics, such as neonatal resuscitation training and decision-making for airway management in the pre-hospital environment.[18-19]

The literature is comprehensive with regard to the application of this strategy among health professionals or students, pointing to satisfactory results and promising investment in the subject, as an important tool for disseminating knowledge and training skills.[18-21] According to a systematic review, whose objective was to identify the impacts of virtual simulation on the learning outcomes of nursing students, some studies show that virtual simulation is capable of generating learning retention over time.[21]

However, there is a lack of studies demonstrating the effects of face-to-face simulation or telesimulation among lay people. Despite being scarce, the literature indicates that this strategy is promising. According to an investigation that aimed to analyze the contributions of telesimulation to the knowledge of mothers faced with foreign body airway obstruction in children under one year of age, telesimulation promoted an increase in immediate knowledge about the prevention and management of airway obstruction, as well as maintaining the knowledge acquired after six months.[11] Another study carried out at a public university in the south of Brazil used face-to-face simulation to train caregivers of children with special health needs and resulted in caregiver safety when carrying out care procedures and routines.[22]

For learning mediated by telesimulation to be effective for participants and clearly convey the proposed objective, the scenario needs to be well structured to meet all the requirements. This construction must be based on scientific evidence and guidelines that propose good practices and recommend fundamental elements. In this study, we chose to use the Nursing Education Simulation Framework guidelines, which provide theoretical guidance for planning, conducting, and evaluating simulated activities.[12] However, there are other guidelines that guide simulation-mediated research, for example, the study that proposed building and validating a realistic simulation scenario on communicating difficult news in the context of palliative care considered the recommendations of the International Nursing Association for Clinical Simulation and Learning (INACSL).[23]

This scenario included a simulated actor and a mannequin, characterizing it as a hybrid simulation. According to a publication that characterized simulation practices in nursing courses in Brazil, hybrid simulation is among the most applied modalities among undergraduate courses.[24]

In order to simulate the sound of crying, coughing, and vomiting, a low-fidelity mannequin was used with a portable Bluetooth-activated speaker inside the cloth chest. The literature shows that high-fidelity simulation is capable of providing significant levels of knowledge and skills in various teaching situations due to its reliable approximation to reality.[25-26] Low-fidelity simulation is also capable of promoting satisfactory results, so well-prepared simulation strategies lead to positive results, both with the use of expensive resources (high-fidelity simulators) and more accessible resources (simulated patients and low-fidelity mannequins).[27]

Once the scenario has been built, an evaluation tool must also be structured to identify any weaknesses, gaps, or the need to readjust any items. In this study, the instrument used was based on an article whose aim was to discuss and evaluate guidelines to guide scenarios based on good evidence-based practices.[14] However, the adoption of the Simulation Design Scale aims to identify elements that need to be adjusted from the point of view of the simulation participants.[28]

In telesimulation design, all the components are important for the learning process. However, debriefing is the element that stands out in this strategy. This can be defined as a structured process focused on providing feedback, analyzing the actions presented, and stimulating reflections in order to promote improvements in learning and the development of future skills. At this stage, participants are invited to analyze the telesimulation experience and the learning process, guided by the facilitation of a supervisor.[29] This stage promotes analysis of practice and improvement of skills through reflection, unifying acquired knowledge with pre-existing knowledge on the subject. The success of the debriefing lies in the facilitator's ability to guide thinking about successes and failures, the identification of priorities concerning the topic, and the participant's cognition, corroborating the acquisition of knowledge.[30]

Although it is not this study's main purpose, it is important to highlight the innovation brought about by holding a focus group with experts, whose purpose was to discuss and exchange opinions on the scenario analyzed, as well as to propose suggestions for improvement. This data collection strategy stands out for its practicality and low cost, as well as being applicable to various areas of knowledge and allowing it to be carried out both in person and virtually.[13]

Finally, a limitation was the failure to include mothers of children under one year of age in the expert group to validate the scenario. This limitation is justified by the importance of considering the perception of the target audience in the processes of validating research instruments, as well as simulated scenarios.

It should also be noted that the development of this scenario contributes to professional practice and the dissemination of knowledge among a broad group of laypeople since it has a low application cost and can be reproduced in various digital media and access conditions, contributing directly to reducing the rates of occurrence of the event and, consequently, reducing hospitalization and infant mortality rates.

Conclusion

A telesimulation scenario on the management and prevention of foreign body airway obstruction in children under one year old, aimed at laypeople, was rigorously constructed, using up-to-date scientific evidence on the subject. Validation of content and appearance by a panel of specialists with expertise in the subject indicated that the scenario is clear, organized, and capable of achieving the proposed objectives. This study provides a valid telesimulation strategy suitable for future applicability and reproducibility.

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