Obstetric cardiopulmonary arrest: construction and validation of an instrument to assess nursing knowledge

Parada cardiorrespiratória obstétrica: construção e validação de instrumento para avaliar o conhecimento da enfermagem

Parada cardiorrespiratoria obstétrica: construcción y validación de un instrumento para evaluar los conocimientos de enfermería

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ABSTRACT

Objective: To build and validate an instrument to assess nursing knowledge about obstetric cardiopulmonary arrest.

Methods: A methodological study consisting of the construction of the instrument, content validation by 23 experts and validation of internal consistency with 74 nursing professionals and 99 nursing students. Items with a minimum agreement of 90%, verified from the Content Validation Index, Content Validity Ratio and binomial test were considered valid. Cronbach's alpha was used to verify internal consistencyand a value greater than 0.6 was classified as acceptable.

Results: The instrument consisted of 16 multiple-choice questions, from the 16 items evaluated, eight had 100% agreement by the experts and six had 95%. The lowest content validity ratio was 0.82 and Cronbach's alpha was 0.694.

Conclusions: The instrument was constructed and validated, and its use is recommended to assess knowledge in obstetric cardiopulmonary arrest.

Keywords: Teaching. Educational measurement. Education, nursing. Cardiopulmonary resuscitation. Obstetrics.

RESUMO

Objetivo: Construir e validar instrumento para avaliar o conhecimento da enfermagem sobre parada cardiorrespiratória obstétrica.

Métodos: Estudo metodológico composto pela construção do instrumento, validação de conteúdo por 23 especialistas e validação da consistência interna com 74 profissionais da enfermagem e 99 estudantes de enfermagem. Foram considerados válidos os itens com concordância mínima de 90%, verificada a partir do Índice de Validação de Conteúdo, Razão de Validade de Conteúdo e teste binomial. O alpha de Cronbach foi utilizado para verificar a consistência interna e o valor superior a 0,6 classificado como aceitável.

Resultados: O instrumento foi composto por16 questões de múltipla escolha, dos 16 itens avaliados, oito possuíram concordância de 100% e seis 95%. A menor razão de validade de conteúdo foi de 0,82 e o alpha de Cronbach foi de 0,694.

Conclusões: O instrumento foi construído e validado, recomendando-se sua utilização para avaliação do conhecimento em parada cardiorrespiratória obstétrica.

Palavras-chave: Ensino. Avaliação educacional. Educação em enfermagem. Reanimação cardiopulmonar. Obstetrícia.

RESUMEN

Objetivo: Construir y validar un instrumento para evaluar el conocimiento de enfermería sobre parada cardiorrespiratoria obstétrica.

Métodos: Estudio metodológico que comprendió la construcción del instrumento, validación de contenido por 23 especialistas en parada cardiorrespiratoria obstétrica y validación de la consistencia interna con 74 profesionales de enfermería y 99 estudiantes de enfermería. Se consideraron válidos los ítems con una concordancia mínima del 90%, verificados a partir del Índice de Validación de Contenido, Índice de Validez de Contenido y prueba binomial. Se utilizó el alfa de Cronbach para verificar la consistencia interna.

Resultados: El instrumento constó de 16 preguntas de opción múltiple. De los 16 ítems evaluados, ocho tuvieron 100% de acuerdo por los expertos y seis 95%. La razón de validez de contenido más baja fue de 0,82 y el alfa de Cronbach fue de 0,694.

Conclusiones: El instrumento fue construido y validado, para que tenga un uso viable en la práctica de docentes e investigadores.

Palabras clave: Enseñanza. Evaluación educacional. Educación en enfermería. Reanimación cardiopulmonar. Obstetricia.

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■ INTRODUCTION

It is estimated that, annually in Brazil, occur approximately 200,000 cardiopulmonary arrests (CPA), of which 50% occur in a hospital setting[1]. Survival is found in approximately 10.4% of patients, so this condition consists as a cardiovascular emergency of highest priority[2].

In the obstetric population, CPA is considered a rare event, since it affects one in every 12,000 pregnant women, however, its severity culminates in high maternal and fetal risk[2]. Obstetric emergencies, such as hemorrhagic and hypertensive disorders, amniotic fluid embolism and anesthetic complications contribute to the involvement of pregnant women by CPA[3]. In cases of multiple pregnancies, associated with comorbidities, the risks tend to be higher, due to the physiological changes of pregnancy that imply a change in maternal cardiovascular overload[4].

In care for CPA in pregnant women, it is necessary for the multidisciplinary team to initiate interventions quickly and correctly to increase the chances of survival and reduce possible sequelae. The obstetric context attributes particularities to Cardiopulmonary Resuscitation (CPR) in pregnant women that differ from the standard care offered to non-pregnant adults. Thus, the service requires knowledge of the team, to provide adequate care to obtain the return of maternal Spontaneous Circulation (ROSC)[2].

The training of professionals on obstetric CPR should be performed in a way directed existing knowledge gap, thus, it is relevant that previous knowledge is verified and that self-assessment occurs, to contribute to the awareness about the need for training[5]. Studies on the effectiveness of pedagogical strategies for teaching CPR in pregnant women also need to take place, to support the choice of the best didactic resource to be used in the teaching-learning process. It is noteworthy the relevance of the existence of an understandable and valid instrument about content, which can be used to assess knowledge about obstetric CPR.

Among the professionals who work in care for CPA, nursing is the category with the highest number of professionals present in health services, so that, in the face of direct and longer contact with the patient, they have a greater chance of witnessing heart failure, on which he/she will need knowledge to act correctly[6]. The pertinence and relevance of building an instrument that can be used to assess the knowledge of this professional category about CPA in pregnant women is pointed out.

The guiding question of the study was: is the instrument to assess nursing knowledge about obstetric cardiopulmonary arrest valid in terms of content, as assessed by experts, and does it have acceptable internal consistency?

The study aimed to build and validate an instrument to assess nursing knowledge about cardiopulmonary arrest in pregnant women.

■ METHOD

Methodological study conducted according to recommendations for the development of measurement instruments in the area of health[7]. Thus, from May to November 2019, three stages were carried out: the first was for the construction of the instrument, in which the conceptual structure was established, the objectives of the instrument and the target population were defined, the items and responses were constructed, the items were selected and organized, and the instrument was structured. In the second stage, content validation took place and in the third, through the application of the instrument with four audiences (technical and higher education students, nurses and nursing technicians working in the emergency and obstetrics units), the internal consistency was verified[7].

The first stage, construction of the instrument, took place in the nursing laboratory of the *Instituto Federal de Educação, Ciência e Tecnologia de Pernambuco* (IFPE) *Campus Pesqueira*. The contents of the following public domain documents were used: Advanced Life Support in Obstetrics (ALSO), American Heart Association (AHA), European Resuscitation Council, Brazilian Society of Cardiology, and the Resuscitation Council of Asia, which are references on the subject. The instrument questions had content referring to the identification of CPA, appropriate conduct for call for help and performing CPR, with the specificities of the obstetric context.

The instrument constructed consisted of 16 objective, multiple-choice questions, each one with five alternatives: one alternative with the correct content (answer), three with possible situations, but not correct and the last alternative consisted of the option "I don't know". It is worth mentioning that the possible situations of the alternatives were elaborated from the knowledge of the authors and from the myths and truths observed in their professional practice.

The second stage, content validation, was conducted electronically, through contact via e-mail. The population of this stage was composed of nurses who are experts in obstetric cardiopulmonary arrest, belonging to the contact network of six professors of the curricular components of Emergency and Obstetrics of the bachelor's degree in nursing at IFPE. These expert nurses totaled 64 professionals, who performed teaching and care functions in the five regions of the country, of which 23 sent a response, thus constituting the study sample.

The inclusion criteria adopted for the professors were having expertise/experience in teaching or care in the areas of obstetrics or cardiopulmonary arrest. Those professionals who, during the data collection period, were on leave of any kind from their work activities were excluded from the sample.

The professionals were contacted by e-mail in which there was a link to access the Google Form, which contained an invitation letter, Free and Informed Consent Form (FICF), an instrument for characterization, which contemplated the professional's specialty, his title and experience in teaching and care, and the instrument in the validation process and the instrument for data collection. The data collection instrument used, in which the professionals recorded their evaluation, was adapted from a previous study and included aspects related to content, language and layout, presented in 14 questions, in which the evaluators could fill in their levels of agreement in a Likert-type scale[8].

The third stage, the evaluation of internal consistency, occurred in four scenarios: the application of the instrument with nursing students was performed at the *Campus Pesqueira* of the IFPE, the application with students of the technical course in Nursing took place at the *Campus Belo Jardim* of the IFPE, while the application with professionals took place in two hospitals of the Unified Health System (*Sistema Único de Saúde* – SUS), a general hospital and a regional hospital, located in the municipalities of Pesqueira and Garanhuns, respectively, both in Pernambuco.

Regarding the stage of application of the instrument with the students, the population consisted of 150 students enrolled in the bachelor's degree in nursing at the *Campus Pesqueira* of the IFPE and the 90 students enrolled in the technical course in Nursing at the *Campus Belo Jardim* of the IFPE. All those who had active enrollment in technical and higher nursing courses on campus were included. All students who were not present at the time of application of the instrument to data collection were excluded and the sampling was consecutive for convenience.

The application of the instrument with undergraduate students was performed in two groups, one in the first and one in the third module of the bachelor's degree in nursing, which totaled 57 students for the sample. It is highlighted that such groups were recruited due to an indication of feasibility of collection pointed out by the course coordinator. In the technical course in nursing, the instrument was also applied in two groups, one in the second and the other in the fourth module of the course, also identified as viable targets for collection by the course coordination, which totaled 42 participants.

For data collection, it was used the instrument consisted of 16 questions about knowledge in obstetric CPA. The collection in each course, technical and higher, respectively, took place by prior appointment with the coordinators of the courses, during class hours, with the authorization of the professor of the scheduled day and in the presence of three researchers and the participants in the classroom. With the students placed in the school chairs, the study was explained, the consent form was signed, and the instrument was handed to be answered without consultation or parallel talk. There was no time limit for filling out the form, which was completed by all students in 40 minutes. At the end of the collection in one class, the same procedure was performed in the second class of the course.

In the application with the professionals, the population consisted of nurses and nursing technicians who worked in the emergency and obstetrics sectors of the two hospitals where data collection was performed, and the sampling was by convenience.

The inclusion criteria were having an employment relationship at the health institution and working regularly in the emergency and obstetrics areas. The exclusion criteria was being on leave (vacation, leave, certificate) during the period in which the data were collected. In one of the hospitals, 16 nurses and 37 nursing technicians from the emergency and obstetrics sectors participated. In the second hospital, 13 nurses and 8 nursing technicians participated, also from the emergency and obstetrics sectors.

Data collection in each hospital was conducted in a meeting room, in the presence of three researchers and participants, the study was explained, the informed consent form was signed and the instrument to be answered was given. Without setting a time limit for completion, it was completed by all professionals in 50 minutes. The same instrument used with the students was used with the professionals.

Thus, the analysis of internal consistency occurred from the application of the instrument with 173 participants, of which 74 were professionals (29 nurses and 45 nursing technicians) and 99 nursing students (57 undergraduate students and 42 technical students). It is noteworthy that this number is compatible with the verification of internal consistency, since this must occur with a sample consisted of five to ten participants per item in the instrument[9]. When considering the existence of 16 questions in the instrument, the estimated sample would be from 80 to 160 participants.

Data analysis was performed using the R software. For the content validation stage, the Content Validity Index (CVI) was calculated for each item, which corresponded to the sum of agreements obtained in the item, divided by the total of evaluations/answers assigned to that item. The overall CVI was also calculated, which corresponded to the mean of the CVIs of all items. In addition, to verify whether the agreement

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obtained was equal to or greater than the value established to consider the item valid 0.90%[10], the binomial test was used, with a significance level of 95%. Data analysis to verify the instrument's reliability was performed using Cronbach's alpha. It ranges from 0 to 1 and, for the present study, a value greater than 0.6 was considered acceptable[11].

As a complement to the CVI, it was calculated the Content Validity Ratio (CVR), correcting possible gaps in random agreement arising from the CVI. In this measure, the judges classified each item of the questionnaire as essential (1); useful, but not essential (2) and unnecessary (3).

For the CVR, the following formula was used: CVR= ne – (N/2) / (N/2), where "ne" is the amount of agreement 3 (essential items) and "N" represents the total number of participants, where the same 23 judges participated in the sample. It should be noted that 0.6 is the lowest acceptable value to be obtained through the CVR[12].

The research followed the ethical guidelines determined by Resolution 466/12 and was approved by the Research Ethics Committee of the Educational Authority of Belo Jardim (opinion 3,150,606).

■ RESULTS

Regarding the judges who participated in the content validation, 12 (52.17%) were experts in Urgency and Emergency and 11 (47.83%) in Obstetrics. As for holders of master's and doctoral degrees, 11 (47.83%) and three (14.04%) were observed, respectively. Regarding professional experience, seven (30.43%) had already performed care activities in pre-hospital urgency and emergency services, three (14.04%) in hospital urgency and emergency and nine (39.13%) in obstetric care. Furthermore, 17 (73.91%) were active in teaching.

In content validation, from the 16 questions of the instrument, 11 (68.75%) had unanimous agreement. Among all the questions, the minimum agreement obtained was 91%, with a minimum CVR of 0.82, so all were considered validated (Table 1).

Table 1 – Agreement of the evaluators regarding the relevance, content and theme of the instrument for assessing knowledge on obstetric cardiopulmonary resuscitation (n=23). Pesqueira, Pernambuco, Brazil, 2021

Question	Relevance		Content		Theme		CVR[‡]
	CVI[*]	p[†]	CVI[*]	p[†]	CVI[*]	p[†]	Mean
1	0.95	0.976	0.95	0.976	0.95	0.976	0.91
2	1	1	1	1	1	1	1
3	0.95	0.976	0.95	0.976	0.95	0.976	0.901
4	1	1	1	1	1	1	1
5	0.95	0.976	0.95	0.976	1	1	1
6	1	1	1	1	1	1	1
7	0.91	0.879	0.91	0.879	0.91	0.879	0.82
8	1	1	1	1	1	1	1
9	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1
12	0.95	0.976	0.95	0.976	0.95	0.976	0.91
13	1	1	1	1	1	1	1
14	1	1	1	1	1	1	1
15	1	1	1	1	0.95	0.976	0.97
16	1	1	1	1	1	1	1

Source: research data, 2019.
[*]CVI = Content Validity Index; [†]p = Binomial test; [‡]CVR = Content Validity Ratio.

Regarding clarity, objectivity, organization and understanding, from the 16 questions of the instrument, nine (56.3%) had unanimous agreement on all items (CVI=1.0 and CVR=1.0). All questions that compose the instrument were considered valid with CVI and CVR above 0.91 and 0.82, respectively. (Table 2).

Regarding the reliability of the instrument, this was observed from the acceptable internal consistency, confirmed by the Cronbach's alpha obtained, which was 0.694.

The final version of the instrument consisted of 16 multiple-choice questions that addressed the recognition of cardiopulmonary arrest, the CPA chain of survival, effective and quality compressions, specific obstetric CPA/CPR care, the compression-ventilation relationship with and without advanced airway, the use of defibrillation in pregnant women and perimortem cesarean section. The two parts/pages that compose the instrument, as well as the template with the correct answers, can be seen in Figures 1 and 2.

Table 2 – Agreement of the evaluators regarding the clarity, objectivity, organization and understanding of the instrument for assessing knowledge on obstetric cardiopulmonary resuscitation (n=23). Pesqueira, Pernambuco, Brazil, 2021

Question	Clarity		Objectivity		Organization		Understanding		CVR[‡]
	CVI[*]	p[†]	CVI[*]	p[†]	CVI[*]	p[†]	CVI[*]	p[†]	Mean
1	0.91	0.879	1	1	0.95	0.976	1	1	0.93
2	1	1	1	1	1	1	1	1	1
3	0.95	0.976	0.95	0.976	0.95	0.976	0.95	0.976	0.91
4	1	1	1	1	0.95	0.976	0.95	0.976	0.95
5	0.95	0.976	1	1	1	1	1	1	0.98
6	1	1	1	1	1	1	1	1	1
7	0.91	0.879	0.91	0.879	0.91	0.879	0.91	0.879	0.82
8	1	1	1	1	1	1	1	1	1
9	1	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1	1	1
12	0.95	0.976	0.95	0.976	0.95	0.976	0.95	0.976	0.91
13	0.95	0.976	0.95	0.976	0.95	0.976	0.95	0.976	0.91
14	1	1	1	1	1	1	1	1	1
15	1	1	1	1	1	1	1	1	1
16	1	1	1	1	1	1	1	1	1

Source: research data, 2019.
[*]CVI = Content Validity Index; [†]p = Binomial test; [‡]CVR = Content Validity Ratio.

NURSING KNOWLEDGE ABOUT OBSTETRIC CARDIOPULMONARY ARREST

1. How is the heart rate of a pregnant woman undergoing CPA?
a)   Absent in any artery for more than 2 seconds and less than 5.
b)   Absent in any artery for more than 5 seconds and less than 10.
c)   Absent in the carotid or femoral artery for more than 2 seconds and less than 5.
d)   Absent in the carotid or femoral artery for more than 5 seconds and less than 10.
e)   I don't know.

2. How is the breathing of a pregnant woman undergoing CPA?
a)   Mandatory present.
b)   Mandatory absent (apnea).
c)   Present or gasping.
d)   Absent (apnea) or gasping.
e)   I don't know.

3. In an unconscious pregnant woman, to identify the CPA, the health professional must check:
a)   Maternal heart rate in any artery, maternal breathing and fetal heart rate.
b)   The maternal heart rate in any artery and maternal breathing.
c)   Maternal heart rate in carotid or femoral artery, maternal breathing and fetal heart rate.
d)   Maternal heart rate in carotid or femoral artery and maternal breathing.
e)   I don't know.

4. When confirming the CPA in the pregnant woman, the first action that the health professional should do is:
a)   Check maternal vital signs and fetal heart rate.
b)   Start chest compressions.
c)   Call for help and request the defibrillator.
d)   Call the obstetrician.
e)   I don't know.

5. Faced with an obstetric CPA, before performing chest compressions it is necessary:
a)   Leave the pregnant woman on a soft surface, such as the mattress.
b)   Position the rigid board on the pregnant woman's back, without tilting.
c)   Position the rigid board on the pregnant woman's back and slightly tilt the board to the left.
d)   It doesn't matter, because compressions are effective with the pregnant woman in any of these positions.
e)   I don't know.

6. In non-pregnant adults, what is the electrical charge that should be applied by defibrillation, in cases of CPA with shockable rhythm:
a)   Use a charge of 120 joules, regardless the defibrillator is monophasic or biphasic.
b)   Use a charge of 200 joules, regardless the defibrillator is monophasic or biphasic.
c)   Use a charge of 360 joules, regardless the defibrillator is monophasic or biphasic.
d)   If the defibrillator is monophasic: use a charge of 360 joules. If the defibrillator is biphasic: use a charge of 120 to 200 joules, according to the manufacturer and, in the absence of a manufacturer's recommendation, use 200 joules.
e)   I don't know.

7. To perform chest compressions, considering the anatomical change caused by the pregnant abdomen, the healthcare professional must position their hands:

a)   In the lower third of the sternum, releasing the xiphoid process.

b)   In the middle third of the sternum.

c)   In the upper third of the sternum.

d) Anywhere on the sternum.

e) I don't know.

8. To perform chest compressions in pregnant women, considering the anatomical alteration caused by the pregnant abdomen, the health professional must position in their hands:
a)   In the lower third of the sternum, releasing the xiphoid process.
b)   In the middle third of the sternum.
c)   In the upper third of the sternum.
d)   Anywhere on the sternum.
e)   I don't know.

Figure 1 – Instrument to assess nursing knowledge about cardiopulmonary arrest in pregnant women – part 1. Pesqueira, Pernambuco, Brazil, 2021
Source: Designed by the authors.

9. Considering the decrease in chest compliance, the diaphragmatic elevation and the increase in blood volume, existing during pregnancy, how should be the velocity applied to compress the chest of the pregnant woman in CPA?
a)   Same as used in CPR of non-pregnant adults: from 100 to 120 per minute.
b)   Faster than that used in non-pregnant adults CPR: from 120 to 140 per minute.
c)   Slower than that used in non-pregnant adults CPR: from 80 to 100 per minute.
d)   Depends on gestational age: the higher the gestational age, the faster it must compress.
e)   I don't know.

10. When considering that the pregnant abdomen tends to compromise the vena cava flow, what care should be taken in CPR in pregnant women?
a)   Only manually move the uterus to the left.
b)   Only tilt the pregnant woman slightly (about 30°) to the left.
c)   Manually move the uterus to the left or slightly tilt (about 30°) the pregnant woman to the left.
d)   Elevate the pregnant woman's lower limbs to optimize venous return..
e)   I don't know.

11. Care for the pregnant abdomen, in the previous question, should be instituted in:
a)   All pregnant women undergoing CPA, regardless of gestational age.
b)   Only in pregnant women with a gestational age of up to 15 weeks.
c)   Only in pregnant women who are from 20 weeks of gestation or whose uterine fundus height is at or above the umbilical scar.
d)   In pregnant women with more than 25 weeks of gestation.
e)   I don't know.

12. What is the correct way to perform manual uterine traction?
a)   If positioned to the left of the pregnant woman: pull the uterus to the left with both hands. If placed on the pregnant woman's right: push the uterus to the left with one (dominant) hand.
b)   Regardless of which side the pregnant woman is, always use both hands to pull the uterus to the left.
c)   Regardless of which side the pregnant woman is, always use only one hand (dominant) to pull the uterus to the left.
d)   Whatever: regardless of which side the pregnant woman is, may use one hand or both hands to pull the uterus to the left.
e)   I don't know.

13. In view of the elevation of the diaphragm and the increase in oxygen demand, existing during pregnancy, it is important to correctly ventilate the pregnant woman in CPA. In pregnant women undergoing CPA, who do not have an advanced airway (orotracheal tube or supraglottic device), the correct way to ventilate is:
a)   Same as used in CPR for non-pregnant adults: 30 x 2 or uninterrupted (compressions of 100 to 120 ventilations every 6 seconds).
b)   Same as used in CPR of non-pregnant adults: in the proportion 30 x 2.
c)   More frequently than in non-pregnant adults CPR: in a 15 x 2 ratio.
d)   Less frequently than in non-pregnant adults CPR: in the proportion 30 x 1.
e)   I don't know.

14. In pregnant women undergoing CPA, who have an advanced airway (orotracheal tube or supraglottic device), the correct way to ventilate is:
a)   Same as used in non-pregnant adults CPR: 1 ventilation every 6 seconds.
b)   Same as used in non-pregnant adults CPR: in the proportion 30 x 2.
c)   More frequently than non-pregnant adults CPR: 1 ventilation every 3 seconds.
d)   Less frequently than in non-pregnant adults CPR: 1 ventilation every 8 seconds.
e)   I don't know.

15. About the use of Defibrillation, in pregnant women undergoing CPA, it is correct to say:
a)   It is not performed because amniotic fluid conducts electricity.
b)   It must be used with an electrical charge equal to that applied to non-pregnant adults.
c)   It must be used with an electrical charge greater than that applied to non-pregnant adults, because part of the charge is lost in the amniotic fluid.
d)   It must be used with an electrical charge lower than that applied to non-pregnant adults, so as not to hurt the fetus.
e)   I don't know.

16. In pregnant women CPR, regarding perimortem cesarean section, it is correct to say:
a)   It should be considered immediately after the identification of CPA in the pregnant woman.
b)   Should be considered after 5 minutes of CPR, with no return of spontaneous maternal circulation.
c)   Should be considered after 10 minutes of CPR, without return of spontaneous maternal circulation.
d)   It should only be considered after certified, by the physician, the death of the pregnant woman.
e)   I don't know.

ANSWERS
1 – D.   2 – D.   3 – D.   4 – C.   5 – B.   6 – D.   7 – B.   8 – A.   9 – A.   10 – A.   11 – C.   12 – A.   13 – A.   14 – A.   15 – B.   16 – B

Figure 2 – Instrument to assess nursing knowledge about cardiopulmonary arrest in pregnant women – part 2. Pesqueira, Pernambuco, Brazil, 2021
Source: Designed by the authors.

■ DISCUSSION

The instrument's questions addressed three thematic axes: correct identification of pulmonary arrest in pregnant women, time to call for help and correct way of performing cardiopulmonary resuscitation in pregnant women. This finding is similar to that found in a study conducted in Norway, which developed and validated an instrument to assess the competence of health professionals in relation to obstetric CPA, and contemplated the same axes[5]. Thus, the relevance of the instrument is to contemplate the identification of the disease and the components of basic life support, which consist of decisive steps for the survival of the mother-child binomial and, therefore, need to be known by nursing.

Regarding the theme of the first axis, aimed at checking/confirming the CPA, it is pointed out that quick recognition must be effective, because the faster the identification that the pregnant woman was affected by a CPA, the earlier the professional will start CPR. Thus, the professional must simultaneously perform the thoracoabdominal inspection in search of chest expansion arising from breathing and palpation of the central artery (carotid or femoral). The absence of a palpable heart rate added to apnea or agonizing breathing characterizes the impairment of cardiac pumping that occurred in CPA[2]. The correct identification was pointed out by a systematic review conducted by researchers in Canada as a critical step for the management of CPA. This review also highlighted the recommendation that future studies to investigate strategies that result in greater prepare and sensitivity so that the disease is recognized quickly and correctly[13].

Regarding the issues that addressed the calling for help, this must be performed by the health professional, immediately after verifying the obstetric CPA[2]. The completion of such a step will enable effective team care and will allow assignments to be delegated to several professionals, such as physicians, nurses, and nursing technicians. These findings corroborate a case report from Turkey, in which the importance of early activation of the multiprofessional team is observed for survival in obstetric CPA[14]. When considering that the rapid activation of the team corroborates the early effective action of the same, confirms the importance of the activation stage of calling for help is included in the instrument, so that gaps about knowledge can be identified and assessed, which has the potential to direct training and qualification of professionals.

The rapid activation of the emergency service results in early arrival of the Automated External Defibrillator (AED). This finding has repercussions on mortality, as observed in a North American study that found equal survival between women in maternal and non-maternal CPA, so that both groups also had similar defibrillation rates[15].

Regarding ventilation of pregnant women affected by CPA, in cases of absence of advanced airway (orotracheal intubation or extraglottic device, such as a laryngeal mask), the compression/ventilation ratio adopted can be 30:2 or compressions can occur in a uninterrupted way, added to ventilations performed once every six seconds. In cases where the pregnant woman has an advanced airway device, the 30:2 protocol should not be adopted, so that uninterrupted compressions must be performed together with ventilation every six seconds[2]. According to researchers from India, hypoxia is poorly tolerated by pregnant women, which accentuates the need for effective ventilation to provide oxygen to achieve success in the challenging resuscitation of obstetric patients[16]. Nursing needs to know this information, since the ventilation of pregnant women in CPA, from the bag-valve-mask, can be performed by this professional category. Therefore, the presence of questions in the instrument that include such information is relevant and can contribute to correct professional practice.

Regarding obstetric CPR, as performed in non-pregnant adults, compressions should occur at a frequency of 100 to 120 per minute, with a force that results in a sinking of 5 to 6 centimeters of the pregnant woman's chest[17]. It is highlighted that pregnancy changes can result in greater rigidity in the chest of pregnant women, which will require the application of greater force by the professional who performs the compression. Another specificity of CPR in pregnant women is manual traction of the uterus to the left side, which should be performed in women with a gestational age of 20 weeks or more. If professionals do not have information on gestational age, uterine traction should occur in pregnant women whose uterine fundus is palpable from the umbilical scar. This procedure aims to relieve aortocaval compression and, consequently, favors venous return during CPR maneuvers[18,19]. Such specificities are also included in the instrument's questions, so that they enable the assessment and self-assessment of this relevant correct conduct to be adopted by nursing during CPR in pregnant women.

Following care for obstetric CPA, after five minutes of CPR without return of spontaneous circulation, it is necessary to consider performing an emergency cesarean section. This procedure is performed not only in an attempt to save the life of the fetus, but as a component of maternal resuscitation, since the decompression of the vena cava, caused by the outflow of intrauterine content, tends to improve the mother's venous return[2]. For this, the cesarean section must be performed at the CPA site, even if outside the operating room, since the act of transporting the patient to another

sector, even with more care resources, will directly affect the quality of CPR provision[19,20]. According to a study that evaluated the CPR of pregnant women in the United Kingdom, cesarean section was performed in 74% of the cases, which resulted in survival of 87.8% of babies and 21% of mothers[21]. Information regarding emergency cesarean section in obstetric CPA needs to be known by nursing, since this professional category is responsible for providing materials and support to the medical professional who will perform the procedure. Thus, relevance is highlighted in the fact that the instrument has questions about this information.

For the care of pregnant women in CPA to occur effectively, it is necessary that the teams working at the different levels of care to be trained, as this condition can affect pregnant women in low-complexity health services, not specialized for emergency obstetric care, so that the preparation of the team will be decisive for maternal and fetal survival. Added to this, it is relevant the training since most professionals are not used to perform obstetric CPA emergencies[17]. A study conducted in the United States highlighted the low level of knowledge associated with low quality in practical skills as obstacles in performing maternal CPR. This situation is worsened when considering that many professionals, even those trained to work in obstetric emergencies, tend to show a loss in knowledge over time[22,23].

The validation of the instrument to assess the knowledge of nursing students and professionals about obstetric CPA obtained agreement and CVR above 90% and 0.82, respectively. This fact is similar to that found in a Brazilian study that validated an instrument to assess nursing knowledge about enteral nutritional therapy[24]. Thus, there is a need and importance for the instruments used by nursing professors to be comprehensible and with correct content, so that their are feasible in the assessment process.

The internal consistency obtained did not have a value greater than 0.7 and, even so, it was classified as acceptable. This classification is ratified and corroborates a study conducted by a researcher from the United Kingdom, who evaluated the use of Cronbach's Alpha in scientific research, whose results show that the authors adopt different values as acceptable for Cronbach's Alpha, depending on the characteristics of the researched instrument[11]. The mentioned study points out that, although many authors follow the rule that the alpha must be at least 0.7 for internal consistency to be acceptable, there are exceptions to this form of reasoning. Among them, it is pointed out that an instrument that has a limited number of questions that assess a wide range of knowledge to be tested, does not tend to present item equivalence (internal consistency), given the different concepts that are explored in each question, within the

same instrument. Thus, values from 0.64 can be considered adequate, and values greater than 0.6 can be classified as satisfactory and acceptable[11].

It is worth noting that the instrument to assess nursing knowledge on obstetric cardiopulmonary arrest, validated in the present study, was composed of 16 questions, which aim to assess a large number of constructs (recognition of cardiopulmonary arrest, CPA survival chain, effective compressions and quality, specific care for obstetric CPA/CPR, compression-ventilation ratio with and without advanced airway, the use of defibrillation in pregnant women and perimortem cesarean section). Thus, the instrument fits the reasoning of the aforementioned paragraph, in which the minimum value of 0.7 of Cronbach's Alpha to consider good internal consistency does not apply and, therefore, the value of 0.694 obtained can be considered satisfactory[11].

As a limitation of the study, it is pointed out the fact that the validation of the instrument occurred about the content with acceptable, but not high internal consistency, so that further research needs to assess its reliability in different contexts, ranging from technical and higher education to training of professionals, especially those who work in the emergency and obstetrics sectors. There is a need for future studies that apply the instrument separately, with a sample consisted exclusively of each aforementioned subgroup, so that the internal consistency is assessed in different contexts. Another limitation is the fact that the instrument was applied to students who had not had previous contact with the curricular component of obstetrics, so that the findings of the study may differ from the reality found from the application with students who have already did a discipline of obstetric subject.

The contribution of the present study to nursing and health come from the availability of an instrument with correct content and understandable language, which can be used to assess the knowledge of nursing professionals and students. Its use will make it possible to identify gaps in the knowledge of this public, in order to direct actions aimed at providing knowledge and professional training on the subject. The instrument can be used in the teaching-research-extension tripod, in projects about obstetric CPA that assess previous knowledge or that test interventions using the instrument.

The instrument from the present study can contribute to the knowledge translation and nursing training so that, as established in the National Curriculum Guidelines, it contributes to the undergraduate professionals being prepared to act in a resolute way in the face of real demands in the job market. In view of the benefit for nursing training, the construction and validation of the instrument are also in

line with the Policies of Comprehensive Care for Women's Health and Emergency Care (*Políticas de Atenção Integral à Saúde da Mulher e de Atenção às Urgências*).

The instrument can be used in the analysis of previous knowledge about obstetric CPA, of nursing students and professionals, so that the results of its use can direct training and adjustments of pedagogical strategies.

■ CONCLUSION

The instrument to analyze the knowledge of nursing students and professionals about obstetric cardiopulmonary arrest was constructed and validated. The final version consisted of 16 multiple-choice objective questions, which address the recognition of cardiopulmonary arrest, CPA chain of survival, cardiopulmonary resuscitation, effective and quality compressions, specific care for obstetric CPA/CPR, compression-ventilation ratio with and without advanced airway, use of defibrillation in pregnant women and peri-mortem cesarean sections.

From the 16 questions, nine had 100% agreement among experts with a CVR of 1.0; five had 95% agreement and CVR of 0.91, while the remaining two had minimum agreement and CVR of 91% and 0.82 respectively. The instrument had acceptable reliability, with Cronbach's alpha 0.694.

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