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RESEARCH

CONSTRUCTION AND VALIDATION OF THE PROFESSIONAL SKILLS OF NURSES WORKING IN HEMODYNAMICS

CONSTRUÇÃO E VALIDAÇÃO DAS COMPETÊNCIAS PROFISSIONAIS DO ENFERMEIRO ATUANTE EM HEMODINÂMICA

CONSTRUCCIÓN Y VALIDACIÓN DE LAS COMPETENCIAS PROFESIONALES DE LOS ENFERMEROS QUE TRABAJAN EN HEMODINÁMICA

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ABSTRACT

Objective: to build and validate professional skills for nurses working in Hemodynamics Units. **Method:** this is a methodological study for the construction and validation of hemodynamic nurses' skills, approved by the Research Ethics Committee under protocol number 67891517.8.0000.5462 and carried out in a public institution of cardiology in the state of São Paulo. In the first stage, an instrument was built to identify the skills of nurses in the hemodynamics sector based on a literature review and local observation; in the second, the instrument was validated by specialists. Data were analyzed by Content Validity Index (CVI) and CVI weighted average. **Results:** competency validation took place after two rounds of evaluation with specialists, resulting in a total of seven competencies related to the Nursing work process, with a weighted average CVI between 88.4 and 99.2 and 74 skills, which were classified according to the type of competence; 14 items were assessed as basic, 10 as intermediate, 34 as advanced and 16 as inconclusive. **Conclusion:** the professional competences for nurses working in Hemodynamics Units were built and validated by specialists, who can subsidize new guidelines on the formation and permanent education of professionals in this area.

Keywords: Nurses and Nurses; Professional Competence; Hemodynamics; Validation Studies.

RESUMO

Objetivo: *construir e validar as competências profissionais para enfermeiros atuantes em Unidades de Hemodinâmica.* ***Método:*** *trata-se de uma pesquisa metodológica de construção e validação das competências do enfermeiro de hemodinâmica, aprovada pelo Comitê de Ética em Pesquisa sob protocolo nº 67891517.8.0000.5462 e realizada em instituição pública de cardiologia do estado de São Paulo. Na primeira etapa, foi construído o instrumento para identificar as competências do enfermeiro no setor de hemodinâmica a partir de revisão de literatura e observação local; na segunda, o instrumento foi validade por especialistas. Os dados foram analisados pelo Índice de Validade de Conteúdo (IVC) e média ponderada do IVC.* ***Resultados:*** *a validação das competências ocorreu após duas rodadas de avaliação junto aos especialistas, resultando num total de sete competências relativas ao processo de trabalho da Enfermagem, com média ponderada de IVC entre 88,4 e 99,2 e 74 habilidades, as quais foram classificadas quanto ao tipo de competência; 14 itens foram avaliados como básicos, 10 como intermediários, 34 como avançados e 16 como inconclusivos.* ***Conclusão:*** *as competências profissionais para enfermeiros atuantes em Unidades de Hemodinâmica foram construídas e validadas por especialistas, os quais poderão subsidiar novas diretrizes sobre a formação e a educação permanente dos profissionais nessa área.*

Palavras-chave: *Enfermeiras e Enfermeiros; Competência Profissional; Hemodinâmica; Estudos de Validação.*

RESUMEN

Objetivo: *construir y validar las competencias profesionales para enfermeros que trabajan en Unidades de Hemodinámica.* ***Método:*** *se trata de una investigación metodológica de construcción y validación de las competencias del enfermero de hemodinámica, aprobada por el Comité de Ética en Investigación bajo el protocolo nº 67891517.8.0000.5462 y realizada en la institución pública de cardiología del estado de São Paulo. En la primera etapa, se realizó la construcción de un instrumento para identificar las competencias de los enfermeros en hemodinámica a partir de la revisión bibliográfica y la observación local, y en la segunda etapa, la validación del instrumento por expertos. Los datos se analizaron mediante el Índice de Validez del Contenido (IVC) y la media ponderada del IVC.* ***Resultados:*** *la validación de las competencias se realizó tras dos rondas de evaluación junto a los especialistas, resultando un total de siete competencias relativas al proceso de trabajo de Enfermería, con una media ponderada de IVC entre 88,4 y 99,2 y 74 habilidades, las cuales se clasificaron en función del tipo de competencia, donde 14 elementos se valoraron como básicos, 10 como intermedios, 34 como avanzados y 16 no concluyentes.* ***Conclusión:***

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las competencias profesionales de los enfermeros que trabajan en Unidades de Hemodinámica fueron construidas y validadas por especialistas, que podrán subsidiar nuevas orientaciones en cuanto a la formación y educación permanente de profesionales en esta área.

Palabras clave: *Enfermeras y Enfermeros; Competencia Profesional; Hemodinámica; Estudios de Validación.*

INTRODUCTION

Cardiovascular diseases (CVD) represent the main cause of morbidity and mortality worldwide.[1] As stated in the World Heart Day 2021 campaign by the Ministry of Health, about 14 million Brazilians have some form of cardiovascular disease, which are responsible for at least 400,000 deaths in the country - which corresponds to 30% of national deaths.

The Hemodynamics Units (HU) provide high-tech interventional diagnostic and therapeutic services in the areas of cardiology, radiology, and neurology. They seek to use faster and more accurate methods that minimize risks to patients.[2]

The technological and scientific apparatus existing in the HU requires a qualified professional team that guarantees an advanced health practice, trained nurses to ensure the quality and effectiveness of services[3] and efficient Nursing care so that the individual with cardiovascular disease receives a treatment that helps his recovery after an invasive procedure. Nurses are expected to develop new professional skills, transform the work process towards quality care and an active, effective, agile profile that seeks knowledge and continuous training, enabling effective management and care. Such attributions are indispensable in highly complex sectors,[4] as is the case of hemodynamics.

However, no specific literature was found on competences related to the hemodynamics nurse, which highlighted the need for the development of this research. This demanded a search among professionals in the area who, based on their experience, would consider what skills were necessary for the development of their activities at HU.

In this study, professional competence was considered as a set of knowledge, skills, and attitudes. It consists of knowing how to act responsibly and recognized by others, which involves knowing how to mobilize, integrate, transfer knowledge, resources and skills in a given professional context, associating theoretical knowledge with practice.[5,6]

By defining the competences in the field of action, it becomes possible, among several actions, to compare the necessary attributes to a sector and what professionals present in their daily practice. With this, there is an opportunity to identify skills gaps and develop action plans to acquire each one of them. In the context of healthcare services, this work, when well executed, benefits organizations, professionals and users who enjoy a great improvement in the quality of care provided.[5]

Faced with this search, national and international researchers have proposed the creation and application of scales and instruments that identify and standardize the skills of nurses in the most varied fields. However, in this area of HU, no established instrument or list of competences was found to guide the training or professional practice of nurses.

Given the above, this research was carried out with the aim of obtaining answers to the following question: *what are the professional skills of nurses working in a hemodynamics unit in order to qualify the care provided?*

OBJECTIVE

Construct and observe evidence of content validity of a panel of professional competencies for nurses working in hemodynamics units.

METHODOLOGY

This is a methodological study of construction and search for evidence of content validity, carried out in a public institution in the state of São Paulo, reference in cardiology. The methodological trajectory of the study followed two steps: i) construction of the instrument with professional skills for nurses working in Hemodynamics Units; and ii) validation of the instrument's content by a panel of specialists. Therefore, the ethical research precepts of Resolution CNS No. 466/2012, and the project was duly submitted and approved by the Research Ethics Committee under protocol No. 67891517.8.0000.5462.

Content validation is one of the methods most used by psychometrists to obtain the validity of a measure.[7] In it, the association between abstract concepts is made through measurable indicators, representing the extent to which each item is measured and proving the phenomenon of interest, as well as the dimension of each item according to what is being investigated. Content validation has two stages: the first constitutes the construction of a panel of competencies and their respective abilities; the second submits the constructed instrument to the analysis and judgment of specialists. For the second stage, it is necessary to be judged by a group of experts experienced in the area so that they can analyze the content

and verify that it is correct and consistent with what is proposed.[8]

For the process of constructing the panel of competencies and their respective skills (first step), an integrative review[9] was initially carried out on the competencies of nurses in UH. For this, the PICO strategy (Population, Intervention, Context), the Medical Subject Headings (MESH) and the following Health Sciences Descriptors (DECs) were used: In addition to using this strategy, the descriptors were freely crossed with each other. The search was carried out in the sources PubMed Central (PMC), Medical Literature Analysis and Retrieval System onLINE (MEDLINE), Latin American and Caribbean Literature in Health Sciences (LILACS), Scientific Electronic Library Online (SciELO), Database of Nursing (BDENF) and SCOPUS. Full articles published in the last 10 years (2007 to 2017), in Portuguese, Spanish and English, and that were related to the theme of professional competence of nurses in hemodynamic patient care were included.

Of the total of 52 articles found, 8 duplicates were excluded, 7 not related to the theme, 17 not available in full, 9 outside the established period and 2 in other languages, leaving 9 articles. To complement the search, surveys were also carried out with the Federal Nursing Council (Cofen, *Conselho Federal de Enfermagem*), the Brazilian Society of Cardiology (SBC, *Sociedade Brasileira de Cardiologia*), the Brazilian Society of Hemodynamics and Interventional Cardiology (SBHCI, *Sociedade Brasileira de Hemodinâmica e Cardiologia Intervencionista*) and the American Heart Association (AHA), having been found a normative opinion from Cofen, a technical manual from SBHCI, two national guidelines from SBC and an AHA guideline.

For the evaluation of studies, the selection was performed in pairs, followed by categorization of objectives, method, and results. For the analysis of the types of study and the origin of the evidence from levels 1 to 7, Melnyk & Fineout-Overholt[10] was adopted. SBC on Processes and Competencies for Training in Cardiology in Brazil.[11]

Faced with the scarcity of specific literature on the skills of nurses in the HU,[12,13] direct, structured, and non-participant observation was carried out for 30 days. This observation aimed to identify, in loco, the professional skills of nurses and to apprehend technical-scientific, behavioral aspects and relevant environmental conditions for the elaboration of instrument items in the HU of a public hospital specialized in cardiology and a reference in the city of São Paulo. In the subsequent phase, the competence items found in the literature, in the SBC Guideline on Processes and Competencies for Training in Cardiology in Brazil and in the observation of the researcher were listed.

Items that involved the need for knowledge, those that required evaluation attitudes, decision-making or conduct and items from the psychomotor scope were included, emphasizing that these dimensions were observed but were not addressed in the study, as it is not within the scope of this work. These competence items were categorized by affinities and Nursing work processes that involved assistance, management, teaching, and research. Competences and their respective skills were referenced, and those arising from the researcher's observation were identified with the letter P.

The second step sought evidence of content validity; for this purpose, a judging panel was constituted with specialists considered experts in the subject to assess the relevance, pertinence, clarity, and applicability of the constructed instrument. Inclusion criteria were being a nurse; have specialization in Cardiology, Cardiovascular Nursing or Interventional Cardiology; have professional experience of at least two years in a hemodynamics laboratory; and be active in a leadership position. Those who did not agree to consent to participation or did not send the response within the established period were excluded.

Usually, the panel of experts is constituted to seek a set of thoughts from scientifically guided professionals to build or evaluate a given context or practical situation, with no consensus on how many evaluators are needed to validate an instrument. Thus, using snowball sampling - which consists of the strategy in which the first participating subjects indicate other subjects who meet the study inclusion criteria -, the sample universe was dependent on the intentionality of the participants who met the selection criteria. inclusion.[14] The researchers made contact with 7 professionals by e-mail, presenting a formal invitation, informing the objectives and purpose of the study; 5 professionals agreed to participate in the research. The study was carried out from June to November 2017 by completing and signing the Free and Informed Consent Form (ICF) by the specialists who agreed to participate in the validation process of the proposed content.

It was proposed to the specialists that they evaluate the competences and their items of skill, attitude, and knowledge according to their relevance (importance for the professional practice of the hemodynamics nurse), pertinence (coherence of the item with professional practice in the field), clarity (clear and easy-to-understand textual expression) and applicability (feasibility of using the skill in professional practice) based on the Likert-type scale. The evaluation criteria were option 0 = Disagree; 1

= Partially Disagree; 2 = Partially Agree; and 3 = Agree. Also, the classification of the type of competence was requested between Basic (B), Intermediate (I) and Advanced (A). The evaluation was carried out using the Likert scale, with categories in four levels of importance and selection of a single answer for each analyzed variable. This facilitates the assessment of the instrument because it provides a numerical score with different degrees of agreement in relation to the subject's statement and reaction, and its use is already consolidated in the literature.[14]

For the statistical treatment in this phase, responses number 2 (Partially Agree) and number 3 (Agree) that showed a consensus ≥ 0.80 were considered validated, and this agreement index was established in the literature.[15] Still in this stage, it was A space was made available for suggestions and considerations for each item of the instrument, which led to refinement of the content proposed in the initial instrument. The experts' agreement regarding the representativeness of the items in relation to the addressed content was measured using the content validity index (CVI), calculated by dividing the number of raters agreeing with the item by the total number of raters.

After the first round of evaluation, the competence items with a CVI above 0.80 and without suggestions from the experts were considered valid. Items with a CVI below 0.80 were readjusted according to the experts' suggestions, as well as items with a CVI above 0.80, but which included the experts' suggestions. After adjustments were made, all items that met the aforementioned criteria were submitted to a second round of evaluation carried out by the same 5 specialists who made up the initial panel.

RESULTS

From the skills panel and your built skills

The constructed panel consisted of 7 competencies, their descriptions and 74 items related to the set of skills, which were distributed into 4 work processes, as shown in Figure 1.

From the expertise panel

The sample consisted of five specialist evaluators, who are nurses (100%) of the female gender (100%) who are fully qualified as specialists in Cardiology or Cardiovascular Nursing. There are also some graduates such as masters (40%) and doctors (20%). Furthermore, they have professional experience in the Southeast (40%), Northeast (40%) and Midwest (20%) regions of Brazil.

At the time of the survey, 100% of the specialists held leadership positions in the hemodynamics/interventional cardiology sector, with a predominance of employment in public institutions (60%) and an average time of 10 years of experience in the area.

Evidence of content validity of the competency panel

The evaluation of the evidence of content validity of the panel of competences and their respective skills by experts occurred after two rounds of evaluation.

Figure 1 - Distribution of total items and competencies in the work process axes. São Paulo, 2017

Work Process	Competence	Description of the Competence	Total de Items
Assistance	Peri Proceedings	Provide comprehensive and systematized care, from admission to discharge, related to clinical evaluation, preparation, carrying out the therapeutic or diagnostic procedure, post-intervention assistance, discharge from the hemodynamics sector; with the multidisciplinary team[11,13,16-22,P]	18
	Complications	Provide Nursing assistance in prevention and/or care with complications during and after the procedure, communicating the medical team[11,13,16-19,21,23,P]	10
Teaching	Users Education	Provide guidance to users and/or family members on care related to the procedure and actions to prevent injuries, from admission to hospital discharge[11,13,16,18,19,20,P]	06
	Professional Training/ Continuing Education	Ensure the competences (knowledge, skills and attitudes) required for the performance of the nurse in hemodynamics, as well as the continuous professional qualification of Nursing for updating and improvement in the face of changes in the world of work[11,13,19,21,22,P]	14
Management	Assistance Management	Implement the service, continuously monitor its infrastructure, process and work results for the quality of user assistance; manage indicators; adverse events[11,13,16-19,22,P]	10
	Resource Management	Manage resources with reallocation efficiency to reduce cost and waste[18,19,22,P]	09
Research	Research	Develop research and clinical practice based on evidence, aiming at transforming work[12,19,22,23,P]	07

In the first round, there was consensus on 6 competencies and 63 items (85.1%). Of the 11 items that were not validated (14.9%), all had suggestions for modification. In addition to them, the specialists pointed out opportunities for improvements in 18 items already validated in the first round (24.3%), which, after the authors' evaluation, were considered relevant and underwent changes in their writing.

The suggestions were reviewed by the researchers, and the modified ones were presented again in the second round of the evaluation. Competency 1 (Peri Procedure) underwent modifications in 7 items; Competency 2 (Complications) required 6 changes; Competency 3 (User Education) underwent changes in 3 skills. In Competency 4 (Professional Training and Continuing Education) 8 items were changed; Skills 5 (Assistance Management) and 6 (Resource Management) presented changes in 2 items each; and Competency 7 (Research) required changes in only 1 item.

In order to provide greater clarity with regard to the changes made, Figure 2 was prepared. It contains the original and modified versions of the items, in addition to the average value of the CVI (weighted average of the 4 aspects evaluated) for each round.

Table 3 presents the total evaluation of each competence, in which only Competency 4 (Professional Training and Continuing Education) needed to readjust the items contained therein, since the Universal Agreement (UA) had a total value of less than 0.8, minimum level to characterize the competence as validated. In order to facilitate reading and understanding, the weighted average of the CVIs and UAs by competence and rounds was performed, being presented in the last column of the table.

After resubmission and the second round of expert analysis, all modified panel items were validated. The competencies and their items are presented in Table 1.

As for the classification of the type of competence, 14 items were considered basic, 10 intermediate and 34

Figure 2 - Distribution of items in original, modified, and corresponding average CVI versions. São Paulo-SP. 2017

Work Process	Competence	Original Version (First round)	Modified Version (Second round)
Assistance	1. Peri Procedure	1. Prepare the patient for the procedure in the preprocedural room with measurement of weight and height, trichotomy, and puncture of a large vein. (CVI=0.8)	1. Supervise the preparation or prepare the patient for the procedure in the preprocedural room with measurement of weight and height, trichotomy, and puncture of a large vein to be performed by the Nursing team. (CVI=1.0)
		4. Prepare the room for the procedure, setting up the auxiliary table, polygraph monitoring circuits, contrast injection pump and arranging sterile fields on the table. (CVI=0.75)	4. Supervise the preparation or prepare the procedure room by the Nursing team with assembly of the auxiliary table, arrangement of sterile fields on the table, assembly of monitoring circuits by the polygraph and contrast injection pump. (CVI=0.95)
		5. Receive the patient in the procedure room. (CVI=0.85)	5. Receive the patient in the procedure room, the team at the reception, carrying out an institutional checklist for hemodynamic procedures. (CVI=0.75)
		6. Prepare the patient for the procedure in the room, performing monitoring, degerming and asepsis of the skin and placing sterile fields on the patient. (CVI=0.75)	6. Supervise the reception or receive the patient for the procedure in the room, monitoring, degerming and asepsis of the skin and placing sterile fields on the patient. (CVI=0.95)
		8. Assist the medical team only with regard to material requests and patient complaints. (CVI=0.3)	8. Assist the medical team in providing material resources and patient complaints. (CVI=1.0)
		9. Promote the patient's comfort, knowing the main discomforts and positioning them properly on the procedure table in bed. (CVI=0.75)	9. Promote the patient's comfort, knowing the main discomforts and positioning them properly on the procedure table and later on the bed. (CVI=1.0)
		10. Control frequency, output, and characteristics of spontaneous diuresis or by vesicle urinary catheter. (CVI=1.0)	10. Measure frequency and note output and characteristics of spontaneous diuresis or via vesicle urinary catheter. (CVI=0.85)

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Figure 2 - Distribution of items in original, modified, and corresponding average CVI versions. São Paulo-SP. 2017

Work Process	Competence	Original Version (First round)	Modified Version (Second round)
Assistance	2. Complications	2. Assess cardiovascular and psychological risk factors, contrast-induced nephropathy. (CVI=0.95)	2. Assess cardiovascular, neurological, and renal risk factors. (CVI=1.0)
		3. Assess signs of neurological complications. (CVI=1.0)	3. Evaluate signs of neurological and renal complications, with emphasis on contrast-induced nephropathy. (CVI=1.0)
		5. Monitor for signs of cardiac tamponade, low cardiac output, and coronary occlusion after the procedure, taking into account chest pain complaints. (CVI=1.0)	5. Monitor signs of cardiac tamponade, myocardial ischemia, low cardiac output, and coronary occlusion after the procedure, taking into account complaints of precordial pain and alterations in the electrocardiographic tracing. (CVI=1.0)
		6. Identify signs of vascular complications such as myocardial ischemia, bleeding, ineffective peripheral perfusion, and warming the extremities if necessary. (CVI=0.75)	6. Identify signs of vascular complications, such as bleeding, bruising, pain at the puncture site, and decreased peripheral perfusion, warming the limb when necessary. (CVI=1.0)
		7. Perform compression at the puncture site in cases of bleeding, requesting medical intervention. (CVI=1.0)	7. Perform compression at the puncture site in cases of bleeding, requesting medical intervention when necessary. (CVI=1.0)
		9. Know when and how to perform pericardiocentesis, temporary pacemaker implantation, and the potential complications associated with their use. (CVI=0.8)	9. Assist safely during pericardiocentesis, temporary pacemaker implantation and potential complications associated with its use. (CVI=1.0)
Teaching	3. Users Training	1. Safely guide the patient and family before and after the procedure on general care, the procedure for removing the introducer, resting, and moving in bed, and signs of complications at the puncture site, in agreement with the medical team. (CVI=0.95)	1. Guide the patient and family members before and after the procedure on general care, the procedure for removing the introducer, bed rest and movement, as well as signs of complications at the puncture site, in agreement with the medical team and using easy-to-understand language. (CVI=1.0)
		4. Assist the family and patient, guiding them in the face of social problems. (CVI=0.55)	4. Paying attention to social problems, as a determinant of the health-disease process, referring the patient and family to the responsible professional for this type of care as needed. (CVI=1.0)
		5. Provide illustrative leaflets to facilitate communication between professionals, patients, and family members. (CVI=0.9)	5. Provide illustrative leaflets related to the educational actions developed in the pre-, trans- and post-procedure periods, aiming to facilitate communication between professionals, and family members. (CVI=0.9)
	4. Professional training	1. Be a nurse, with a minimum specialization in cardiology, interventional cardiology or have passed the title test of the Brazilian Society of Cardiovascular Nursing (SOBENC, Sociedade Brasileira de Enfermagem Cardiovascular) or responsible board. (CVI=0.9)	1. Be a nurse, with specialization in cardiology or interventional cardiology, or have passed the title test of the Brazilian Society of Cardiovascular Nursing (SOBENC, Sociedade Brasileira de Enfermagem Cadiovascular) or received a title grant from the Federal Nursing Council (COFEN, Conselho Federal de Enfermagem). (CVI=0.85)
		3. Be qualified or a specialist in cardiology to remove an arterial or venous introducer. (CVI=0.5)	3. Be qualified to remove an arterial or venous introducer. (CVI=0.85)
		4. Know all procedures performed, their indications, contraindications, and most frequent complications. (CVI=0.8)	4. Know the procedures performed, their indications, contraindications, and most frequent complications. (CVI=0.85)
		6. Know the outline of the anatomy of the heart, aorta, great vessels, coronary arteries, as well as the arteries used as vascular access during catheterization (femoral, radial, and brachial arteries). (CVI=1.0)	6. Know the outline of the anatomy of the heart, aorta, great vessels, coronary arteries, cerebral vessels and main arterial or venous access routes used during procedures. (CVI=0.85)

Continue...

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Figure 2 - Distribution of items in original, modified, and corresponding average CVI versions. São Paulo-SP. 2017

Work Process	Competence	Original Version (First round)	Modified Version (Second round)
Teaching	4. Professional training	7. Know right and left heart catheterization and coronary and peripheral arteries: renal, mesenteric artery, limb arteries, carotid and vertebral arteries. (CVI=0.8)	7. Know the procedural flow of catheterization of the right and left heart, coronary and peripheral arteries, and their implications. (CVI=0.85)
		10. Interpret angiograms, ventriculograms, aortograms, pulmonary angiograms and peripheral arteriograms in normal and pathological states. (CVI=0.6)	10. Know angiograms, ventriculograms, aortograms, pulmonary angiograms and peripheral arteriograms in normal and pathological conditions. (CVI=0.85)
		12. Perform constant training of the Nursing team regarding the development of new technologies at the national and international level by participating in events in the area of expertise. (CVI=0.95)	12. Train the Nursing team on the development of new technologies nationally and internationally, including participating in events in their area of expertise. (CVI=0.85)
		13. Train the team to participate in transmissions of procedures during events in the area of expertise. (ICVI=0.75)	13. Train the team to participate in transmissions of procedures during events in the area of operation when the Hospital Institution in question has an educational purpose. (CVI=0.85)
Management	5. Assistance Management	2. Carry out planning for the implementation of the service, preparing the unit's physical plan and establishing routines for patient preparation, assembly, and room circulation. (CVI=0.9)	2. Carry out planning for the implementation of the service, contributing to the preparation of the physical plant of the unit and establishing routines for patient preparation, assembly and room circulation. (CVI=1.0)
		6. Refer the patient to cardiac rehabilitation. (CVI=0.45)	6. Refer the patient to the cardiac rehabilitation sector after medical indication. (CVI=0.95)
	6. Resource Management	2. Elaborate kits of materials needed for the procedures according to the preferences of the medical team to restructure the surgical trousseau. (CVI=1.0)	2. Elaborate kits of materials necessary for the procedures according to the particularities of the different medical teams in order to restructure the surgical trousseau. (CVI=1.0)
		4. Create material validation and reprocessing protocols. (CVI=0.6)	4. Create material validation and reprocessing protocols, when necessary. (CVI=1.0)
Research	7. Research	1. Contribute primarily to multidisciplinary research in the area of expertise. (CVI=1.0)	1. Contribute to multidisciplinary research in the field. (CVI=1.0)

advanced. In addition, in 16 items there was inaccuracy in the result, since there was a tie between the evaluators between basic and intermediate complexity (1), intermediate and advanced (7) and basic and advanced (8).

From the competency panel and your validated skills

Figure 3 contains the description of each of the validated skills (whether in the first or second round) corresponding to each competency and work process, thus representing the final instrument.

DISCUSSION

The Hemodynamics Units (HU) are units whose highly complex diagnostic and therapeutic specificity require a qualified professional team, aimed at patient safety, quality, and effectiveness in the services. It should include trained nurses with professional skills and in continuous updating so that they can meet this demand for changes and transformations in the world of work.[2-4]

From the evaluation of the specialists and the adjustments made, it was possible to verify that the construction and validation of the panel of professional competences

Table 1 - Presentation of Content Evidence Index (CEI) and Universal Agreement (UA) distributed by competence and criteria evaluated in the first and second round. São Paulo-SP. 2017

Competences		Peri Procedure		Complications		Users Training		Professional Training and Continuing Education		Assistance Management		Resources Management		Research		Total	
CEI Criteria		I V C (%)	UA (%)	IVC (%)	UA (%)	IVC (%)	UA (%)	IVC (%)	UA (%)	IVC (%)	UA (%)	IVC (%)	UA (%)	IVC (%)	UA (%)	IVC (%)	UA (%)
Relevance	R1	86.7	94.4	96	100	93.3	83.3	90	85.7	96	90	95.6	88.9	100	100	92.7	91.9
	R2	98.8	100	100	100	100	100	90	100	100	100	100	100	100	100	97.8	100
Pertinence	R1	83.3	83.3	96	100	93.3	83.3	90	85.7	96	90	95.6	88.9	100	100	91.9	89.2
	R2	96.7	94.1	100	100	96.7	100	88.6	100	100	100	100	100	100	100	96.8	98.6
Clarity	R1	91.1	88.9	92	90	83.3	83.3	87.1	85.7	92	90	95.6	88.9	100	100	91.3	89.2
	R2	97.8	100	100	100	100	100	98.6	100	100	100	100	100	100	100	99.2	100
Applicability	R1	83.3	83.3	96	100	80	83.3	82.9	78.6	90	90	95.6	88.9	97.1	100	88.4	87.8
	R2	95.6	94.1	100	100	96.7	100	88.6	100	98.3	100	100	100	100	100	96.3	98.6

Figure 3 - Panel of Professional Skills of Nurses Working in Hemodynamics. São Paulo-SP. 2017

WORK PROCESS	COMPETENCES	
Assistance	**Periprocedural - Refers to providing comprehensive and systematized care, from admission to discharge, related to clinical evaluation, preparation, carrying out the therapeutic or diagnostic procedure, post-intervention assistance, discharge from the hemodynamics sector, together with the multidisciplinary team[11,13,16-22,P]**	
	1 (B)	Supervise the preparation or prepare the patient for the procedure in the preprocedural room with weight and height measurement, trichotomy, and caliber vein puncture[P]
	2 (I)	Check minimum fasting of 3 hours, history of allergic reaction to contrast, medications suspended and mandatory use for the procedure[18,P]
	3 (A)	Perform clinical evaluation, monitoring vital signs and electrocardiographic tracing[13,18,19]
	4 (B/I)	Supervise the preparation or prepare the procedure room with the assembly of the auxiliary table, arrangement of sterile fields on the table, assembly of the polygraph monitoring circuit and contrast injection pump[21]
	5 (B)	Receive the patient in the procedure room[P]
	6 (B)	Supervise the reception or receive the patient for the procedure in the room, performing monitoring, degerming and asepsis of the skin and placing sterile fields on the patient[P]
	7 (A)	Acting in all hemodynamic procedures with the multidisciplinary team and using Personal Protective Equipment[21,22,P]
	8 (B)	Assist the medical team in providing material resources and any patient complaints[P]

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Figure 3 - Panel of Professional Skills of Nurses Working in Hemodynamics. São Paulo-SP. 2017

WORK PROCESS	COMPETENCES	
Assistance	9 (B)	Promote patient comfort, knowing the main discomforts and positioning them properly on the procedure table and, later, on the bed[13,19]
	10 (B)	Control frequency, output, and characteristics of spontaneous diuresis or by vesicle urinary catheter[11]
	11 (B)	Assist patient in personal hygiene, feeding, evacuation and walking, encouraging self-care[19]
	12 (B/A)	Measure rest time after the procedure, aiming at its reduction and monitoring its conditions, in particular, verifying the complete extension of the limb where the arterial or venous puncture was performed[13,16,P]
	13 (I/A)	Remove arterial introducer after training or specialization in cardiology when it is a service protocol[13,16,P]
	14 (A)	Assist in performing analgesia or sedation, checking the activated clotting time, and measuring blood pressure before removing the introducer[13,18,19]
	15 (A)	Perform mechanically or use a suitable device for compression, evaluating signs of peripheral perfusion after removing the introducer[13,16,17,P]
	16 (B/A)	Perform, after removing the introducer, a compressive and occlusive dressing, assessing the presence of bleeding and/or bruising[13,16,17,P]
	17 (A)	Perform the Systematization of Nursing Care and discharge plan, recording the care planned and provided in all stages of the patient's stay in the unit[20,P]
	18 (A)	Analyze exams relating to the clinical context[19]
	Complications - Refers to providing Nursing assistance in preventing and/or caring for complications during and after the procedure, informing the medical team[11,13,16-19,21,23,P]	
	1 (B/A)	Ensure Nursing carefree from damage resulting from malpractice, negligence or recklessness[P]
	2 (A)	Assess cardiovascular, neurological, and renal risk factors[11,13,18,19,23]
	3 (A)	Evaluate signs of neurological and renal complications, with emphasis on contrast-induced nephropathy[11,13,21,P]
	4 (A)	Communicate changes in pressure waves obtained during the procedure[13,18,19,P]
	5 (A)	Monitor signs of cardiac tamponade, myocardial ischemia, low cardiac output and coronary occlusion after the procedure, taking into account complaints of precordial pain and changes in the electrocardiographic tracing[19,P]
	6 (A)	Identify signs of vascular complications, such as bleeding, bruising, pain at the puncture site and decreased peripheral perfusion, warming the limb when necessary[13,16-19,P]
	7 (A)	Perform compression at the puncture site in cases of bleeding, requesting medical intervention when necessary[13,16,17,18,P]
	8 (A)	Act in emergency situations during the procedure safely, including cardiopulmonary resuscitation and life support[21]
	9 (A)	Assist safely during pericardiocentesis, provisional pacemaker implantation and potential complications associated with its use[P]
	10 (A)	Act in cases of retroperitoneal hematoma, pseudoaneurysm, vasovagal reactions and allergic reactions to iodine contrast[16,18,21,P]
Teaching	**User education - Refers to guidance given to users and/or family members about care related to the procedure and actions to prevent injuries, from admission to hospital discharge[11,13,16,18,19,20,P]**	
	1 (B)	Advise the patient and family before and after the procedure on general care, the procedure for removing the introducer, rest and movement in bed, as well as signs of complications at the puncture site, in agreement with the medical team and using easy-to-understand language[11,13,16,18,19,20,P]
	2 (I)	Advise on the importance of hydration after the procedure for adequate contrast elimination[15,P]
	3 (B/A)	Conduct health education for primary and secondary prevention in the cardiology area[13,19,20]

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Figure 3 - Panel of Professional Skills of Nurses Working in Hemodynamics. São Paulo-SP. 2017

WORK PROCESS	COMPETENCES	
Teaching	4 (B)	Pay attention to social problems, as a determinant of the health-disease process, referring the patient and family to the professional responsible for this type of care as needed[11,13,19,20]
	5 (B)	Provide illustrative leaflets related to the educational actions developed in the pre, trans and post-procedure periods in order to facilitate communication between professional, patient and family[13,19,P]
	6 (I)	Provide guidance to patients and/or family members at the time of hospital discharge[13,19,20,P]
	Professional Training and Continuing Education - Refers to the certification of competencies (knowledge, skills and attitudes) required for the performance of nurses in hemodynamics, as well as the continuous professional training of Nursing for updating and improvement in the face of changes in the world of work[11,13,16,19,21,22,P]	
	1 (A)	Being a nurse, with a minimum specialization in cardiology, interventional cardiology or having passed the title test of the Brazilian Society of Cardiovascular Nursing (SOBENC, *Sociedade Brasileira de Enfermagem Cadiovascular*) or responsible board[22]
	2 (A)	Be trained in a hemodynamics laboratory and in a coronary unit, basic life support, advanced life support, and, if necessary, advanced life support in pediatrics[16,22,P]
	3 (B/A)	Be qualified to remove an arterial or venous introducer[13,16]
	4 (A)	Know the procedures performed, their indications, contraindications and the most frequent complications[11,21,P]
	5 (A)	Know the main radioisotopes used in the unit, their risks and the importance of using Personal Protective Equipment[21,22,P]
	6 (A)	Know the outline of the anatomy of the heart, aorta, great vessels, coronary arteries, as well as the arteries used as vascular access during catheterization[11,21]
	7 (A)	Know the procedural flow of catheterization of the right and left heart, coronary and peripheral arteries and their implications[11,21]
	8 (A)	Know the routine measurements of exams collected related to hemodynamics and oximetry, calculation of cardiac output, vascular resistances, valve areas and quantification of shunts[11]
	9 (A)	Know the basic principles and indications for intracoronary ultrasound, Doppler, and pressure assessment[11]
	10 (A)	Know angiograms, ventriculograms, aortograms, pulmonary angiograms and peripheral arteriograms in normal and pathological conditions[11]
	11 (I)	Keep improving the management of human resources and legislation relevant to the hemodynamics unit[22,P]
	12 (I)	Conduct constant training of the Nursing team regarding the development of new technologies at the national and international level by participating in events in the area of expertise[19,22,P]
	13 (I)	Train the team to participate in transmissions of procedures during events in the area of operation when the Hospital Institution in question has an educational purpose[19,22,P]
	14 (I/A)	Perform a continuous assessment of the team, the needs for patient care, the institution, and the community, correlating with the available human resources[P]
Management	**Assistance Management - Refers to the ability to implement the service, continuously monitor its infrastructure, process and work results for the quality of care for the user, managing indicators, risks, infection, adverse events[11,13,16-19,21,22,P]**	
	1 (A)	Develop and monitor specific indicators that help in the quality of Nursing care and present the work unit in its entirety[22,P]
	2 (A)	Perform planning for the implementation of the service, contributing to the preparation of the physical plant of the unit and establishing routines for patient preparation, assembly and room circulation[11,22]
	3 (B)	Perform monthly and weekly work schedules, as well as task schedules for shifts[P]
	4 (B/A)	Directly supervise the sector throughout the period of operation[P]
	5 (I/A)	Monitor clinical outcomes[11,16-18,22]

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Figure 3 - Panel of Professional Skills of Nurses Working in Hemodynamics. São Paulo-SP. 2017

WORK PROCESS	COMPETENCES	
Management	6 (I/A)	Refer patient to cardiac rehabilitation sector after medical indication[11,13,19]
	7 (I/A)	Identify risks of ionizing radiation for patients and staff, supervising radiometric measurements along with the hospital physicist[21,P]
	8 (A)	Mapping periprocedural adverse events[11,P]
	9 (B)	Knowing the time and importance of rest in order to avoid post-procedure complications[11]
	10 (I)	Manage risks, infections, and sentinel events[11]
	Resource Management - Refers to the ability to manage resources (material, human and financial) and efficiently reallocate them to reduce costs and waste[11,16-19,21,22,P]	
	1 (I)	Perform a survey of the most used materials and the need for surgical instruments[22]
	2 (B)	Elaborate kits of materials necessary for the procedures according to the particularities of the different medical teams in order to restructure the surgical trousseau[22]
	3 (B)	Create worksheets and checklist for forecasting and provision of materials and equipment, ensuring permanent materials and knowing the conditions of existing stock[22,P]
	4 (I)	Create validation and reprocessing protocols for materials, when necessary[22,P]
	5 (A)	Analyze costs to intervene in their reduction during procedures and hospitalization period, guiding the team on the prevention of waste or misuse of materials[17,19,P]
	6 (B/A)	Restructure and monitor the number of staff and clinical outcomes, considering the unit's technical safety index[11,16,17,18,22,P]
	7 (I)	Have familiarity and knowledge about hemodynamic monitoring, temporary pacemaker, intra-aortic balloon pump, mechanical ventilation, transport ventilator and use of general anesthesia[P]
	8 (A)	Experience managing and purchasing materials and supplies[22,P]
	9 (A)	Know the equipment that makes up the hemodynamics room, personal protective equipment, materials used for each procedure and principles of the sterile technique for its opening[21,22,P]
Research	**Research - Refers to the development of research and clinical practice based on evidence, aiming at work transformations[12,19,22,23,P]**	
	1 (I/A)	Contribute to multidisciplinary research in the area of expertise[P]
	2 (I/A)	Perform scientific research in order to improve care and modify risk factors after the procedure[12,19,23]
	3 (A)	Develop specific guides to improve clinical practice[12,19,22]
	4 (A)	Develop evidence-based practice using clinical trials[12,19,22]
	5 (A)	Analyze the feasibility of proposals for changing practices[12,19]
	6 (A)	Evaluate your technical, scientific and ethical competence[P]
	7 (B/A)	Use good practice protocols for safety and standardization of the procedure[12,19,P]

Legend: P-researcher; and competence complexity: B-basic, I-intermediary e A-advanced.

of the nurse working in the HU will be essential and contributory to future actions of training and professional practice within the scope of the work processes in Nursing at HU.

Regarding the adjustments made, we were able to identify changes in 3 items of competence: "peri-procedure", which went from "preparing patient/room" to "supervising the preparation or preparing patient/room", corroborating with Law No. 7,498/86, which governs the competencies of nurses in managing or delegating health care to service users.

Still in the first competence, item 5, "receiving the patient in the procedure room", written in a strategic way to draw the attention of those evaluated, was validated in the first round, and underwent changes based on the specialists' suggestion, becoming "receiving the patient

at the reception, carrying out an institutional checklist for hemodynamic procedures". However, in the second round, this item was not validated as to its pertinence and applicability. Among the justifications presented by the specialists, the nurse's unavailability to receive all patients stands out due to the high demand for activities.

Thus, skill 5 is present in the final instrument, described as validated in the first step. However, what draws attention about this item is that the specialist, in his suggestions, delegates the action of receiving the patient to the receptionist, which can be understood as a depreciation of Nursing care. This may imply that the professional considers the need for scientific knowledge unnecessary, making it a mere administrative formality, which is opposed by Lima,[24] who establishes routines for this procedure, aiming at patient safety.

In item 13, "remove arterial introducer after training or specialization in cardiology when it is the service's protocol", although validated in the first round, the contradictions present in legal regulations are highlighted. In normative opinion COFEN No. 001/2015, it is discussed that the nurse has legal support and the duty to have competence and qualification to perform the removal of arterial or venous introducer catheter in patients undergoing percutaneous coronary interventions. In the normative opinion Federal Council of Medicine No. 22/2017, it is concluded that this procedure is a medical responsibility and competence and cannot be delegated to another professional. This competence, although controversial, was maintained, considering that, currently, nurses perform the procedure using institutional protocols with due approval and protection from the clinical board, with the endorsement of the literature.[12,16]

In competence 4, "professional training and continuing education", item 10, described in the first round as "interpreting angiograms, ventriculograms, aortograms, pulmonary angiograms and peripheral arteriograms in normal and pathological states"[15], the verb was changed to "know", since the term "interpret" was understood by the specialists as an action inherent to the physician in carrying out the examination report.

It is also worth mentioning that in this competence, the UA of applicability was 78.6%, as one of the specialists evaluated items 1 and 2 as "partially agree", and the other items from 3 to 14 as "disagree", suggesting which are dispensable when the first two items are in agreement, contributing to the drop in the percentage regarding applicability. In the authors' view, such an assessment should be rethought, as the lack of theoretical preparation directly impacts the performance of professional nurses in the hemodynamics sector. This professional must have such knowledge because the pathologies and procedures described in these items are present in the routine of the sector.

With regard to the items validated in the first round and which presented suggestions for description (such as item 10 of the peri-procedural competence and items 1, 6 and 12 of the professional training and continuing education competence), the one with the highest average was considered weighted CVI - despite the perception of the researchers that they had the most assertive description after including the suggestions. This fact leads us to the need for clinical validation in the continuation of this study.

Finally, when considering the evaluations according to the type of competence (basic, intermediate, and advanced), 58 items were validated, but 16 were inconclusive, since, during the research, there was not enough time for a third round of evaluation for these requirements. It was considered that the divergent evaluation among the specialists could possibly have occurred due to the difference in the degree of complexity of the service, the routines, and institutional protocols in which they work, as well as the conceptions generated by their different professional experiences.

The study had a temporal limitation, requiring the analysis of competences classified as basic, intermediate, or advanced, based on the literature and highlighting the need for further studies of continuity. In this sense, the researchers started a new study for validation, approved by REC under Protocol No. 62774122.6.0000.5462.

CONCLUSION

The present study contemplated its objectives of building the panel of professional competencies for nurses working in Hemodynamics Units and presenting evidence of content validity. After two rounds of evaluation and changes to the items as suggested by the experts, the 7 skills were validated, as well as their 74 items.

The study brought as a contribution the possibility of building guidelines for the training of skills aimed at nurses who work in Hemodynamics Units, as well as the structuring of permanent education for nurses to work in this area.

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