Original Article

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TEXT & CONTEXT NURSING TEXTO & CONTEXTO ENFERMERÍA

ELABORATION AND VALIDATION OF A TERMINOLOGY SUBSET FOR NEWBORNS WITH CENTRAL VENOUS CATHETERS

Nanete Caroline da Costa Prado[1]
Dhyanine Morais de Lima[1]
Ana Beatriz Pereira da Silva[2]
Bruna Maria Oliveira Mercês[2]
Harlon França de Menezes[1]
Richardson Augusto Rosendo da Silva[1]

[1]Universidade Federal do Rio Grande do Norte, Programa de Pós-graduação de Enfermagem. Natal, Rio Grande do Norte, Brasil.
[2]Universidade Federal do Rio Grande do Norte, Departamento de Enfermagem. Natal, Rio Grande do Norte, Brasil.

ABSTRACT

Objective: to elaborate and validate the content of a terminology subset of the International Classification for Nursing Practice, in light of Betty Neuman's theoretical model, for newborns with a Peripherally Inserted Central Catheter.
Method: a methodological study carried out according to the guidelines of the Brazilian method for developing International Classification for Nursing Practice terminology subsets, through the following stages: 1) Identification of clinical findings relevant to the Nursing practice; 2) Cross-mapping of the findings identified with the International Classification for Nursing Practice terms, version 2019/2020; 3) Elaboration of the Nursing diagnoses, outcomes and interventions statements, based on Betty Neuman's theoretical model; 4) Validation of the statements' content by expert nurses, using the Delphi Technique in two rounds. The Content Validity Index was used for data analysis, where the statements with Content Validity Index values ≥ 0.80 were validated.
Results: 86 clinical findings were identified, allowing for the development and validation of a terminology subset of the International Classification for Nursing Practice, composed of 31 diagnoses/outcomes, categorized according to the levels of intra-personal (3.03%), inter-personal (3.03%) and extra-personal (93.93%) stressors, as well as of 154 Nursing interventions.
Conclusion: the elaboration and validation of a terminology subset of the International Classification for Nursing Practice for newborns with a Peripherally Inserted Central Catheter offers support for better targeted provision of care and for quality assistance.

DESCRIPTORS: Nursing Process. Standardized terminology in Nursing. Nursing diagnosis. Central venous catheterization. Newborn. Neonatal intensive care units.

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CONSTRUÇÃO E VALIDAÇÃO DE SUBCONJUNTO TERMINOLÓGICO PARA RECÉM-NASCIDOS COM CATETER VENOSO CENTRAL

RESUMO

Objetivo: construir e validar o conteúdo de um subconjunto terminológico da Classificação Internacional para a Prática de Enfermagem, à luz do modelo teórico de Betty Neuman, para recém-nascidos com Cateter Venoso Central de Inserção Periférica.
Método: estudo metodológico realizado conforme as diretrizes do método brasileiro para desenvolvimento de subconjuntos terminológicos da Classificação Internacional para a Prática de Enfermagem, através das seguintes etapas: 1) Identificação de achados clínicos relevantes para a prática de enfermagem; 2) Mapeamento cruzado dos achados identificados com os termos da Classificação Internacional para a Prática de Enfermagem, versão 2019/2020; 3) Construção dos enunciados de diagnósticos, resultados e intervenções de enfermagem, a partir do modelo teórico de Betty Neuman; 4) Validação de conteúdo dos enunciados por enfermeiros especialistas, utilizando a Técnica Delphi em duas rodadas. Para a análise dos dados utilizou-se o Índice de Validade de Conteúdo, sendo validados os enunciados com Índice de Validade de Conteúdo ≥ 0.80.
Resultados: identificaram-se 86 achados clínicos, sendo possível a elaboração e validação de um subconjunto terminológico da Classificação Internacional para a Prática de Enfermagem, composto por 31 diagnósticos/resultados, categorizados segundo os níveis de estressores intrapessoais (3,03%), interpessoais (3,03%) e extrapessoais (93,93%), e 154 intervenções de enfermagem.
Conclusão: a elaboração e validação de um subconjunto terminológico da Classificação Internacional para a Prática de Enfermagem para recém-nascidos com Cateter Venoso Central de Inserção Periférica oferecem subsídios para uma prestação de cuidados com melhor direcionamento e a realização de uma assistência de qualidade.

DESCRITORES: Processo de enfermagem. Terminologia padronizada em enfermagem. Diagnóstico de enfermagem. Cateterismo venoso central. Recém-nascido. Unidades de terapia intensiva neonatal.

ELABORACIÓN Y VALIDACIÓN DE UN SUBCONJUNTO TERMINOLÓGICO PARA RECIÉN NACIDOS CON CATÉTER VENOSO CENTRALE

RESUMEN

Objetivo: elaborar y validar el contenido de un subconjunto terminológico de la Clasificación Internacional para la Práctica de Enfermería, sobre la base del modelo teórico de Betty Neuman, para recién nacidos con Catéter Venoso Central de Inserción Periférica.
Método: estudio metodológico realizado conforme a las pautas del método brasileño para el desarrollo de subconjuntos terminológicos de la Clasificación Internacional para la Práctica de Enfermería, a través de las siguientes etapas: 1) Identificación de hallazgos clínicos relevantes para la práctica de Enfermería; 2) Mapeo cruzado de los hallazgos identificados con los términos de la Clasificación Internacional para la Práctica de Enfermería, versión 2019/2020; 3) Elaboración de los enunciados de diagnósticos, resultados e intervenciones de Enfermería, a partir del modelo teórico de Betty Neuman; 4) Validación del contenido de los enunciados a cargo de enfermeros especialistas, utilizando la Técnica Delphi en dos rondas. Para el análisis de los datos, se utilizó el Índice de Validez de Contenido, validando los enunciados con valores de Índice de Validez de Contenido ≥ 0.80.
Resultados: se identificaron 86 hallazgos clínicos, siendo posible elaborar un subconjunto terminológico de la Clasificación Internacional para la Práctica de Enfermería, compuesto por 31 diagnósticos/resultados, categorizados de acuerdo con los niveles de factores estresantes intrapersonales (3,03%), interpersonales (3,03%) y extrapersonales (93,93%), además de 154 intervenciones de Enfermería.
Conclusión: la elaboración y validación de un subconjunto terminológico de la Clasificación Internacional para la Práctica de Enfermería para recién nacidos con Catéter Venoso Central de Inserción Periférica ofrecen asistencia para proporcionar atención mejor direccionada y ofrecer asistencia de calidad.

DESCRIPTORES: Proceso de Enfermería. Terminología estandarizada en Enfermería. Diagnóstico de enfermería. Cateterismo venoso central. Recién nacido. Unidades neonatales de cuidados intensivos.

INTRODUCTION

The Neonatal Intensive Care Unit (NICU) is a specialized environment where essential procedures for the treatment of the sick newborn (NB) are carried out[1]. In this scope, the clinical practice demands the performance of several invasive procedures, including the use of intravenous catheters, such as the Peripherally Inserted Central Catheter (PICC), which consists in an advanced and high-complexity practice. The PICC is used in medium- to long-term treatments and its use covers countless indications, such as parenteral nutrition, antibiotic therapy, infusion of vesicant medications, use of hyperosmolar solutions and administration of chemotherapy drugs[2].

Therefore, PICC handling implies skills and competences that favor safety of the NB during the treatment and reduce the risks of adverse events. Nurses play an important role in the care of neonates with PICCs, and their actions must be carried out through the use of the Nursing Process (NP), which is a methodological tool that provides support for decision-making and guides care practice and organization[3].

As a foundation for the operationalization of the NP, the nurse has conceptual models to favor actions supported by scientific knowledge. Among them, in the Systems Model presented by Betty Neuman, individuals are subjected to stressors arising from their relationship with the environment and can develop reactions to stress. In this sense, Nursing plays a relevant role in maintaining the balance of the person's system[4].

According to such a model, the stressors are categorized as intra-personal (related to the patient's internal issues), inter-personal (related to the interaction that occurs between the client and the near environment), and extra-personal (external forces of environmental interaction that occur outside the client's control). Therefore, from the recognition of the stressors, interventions regarding primary prevention (related to the identification and reduction of risk factors), secondary prevention (interventions and treatment to reduce the harmful effects of the stressors), and tertiary prevention (implemented to restore the client's well-being after the individual's recovery from stress reactions) are listed[4].

It is pointed out that the NP is a tool that favors a systematized and organized care practice, since it guarantees specificity and evidence to the actions, along with its evaluative, organizational and resolute nature of care. Thus, the NP can be documented by means of Nursing classification systems, among which the International Classification for Nursing Practice (ICNP®) stands out[5]. The ICNP® emerges as a tool that favors clinical reasoning, promotes communication among the professionals and allows documenting the care provided. In addition, it favors the development of terminology subsets, which are groupings of concepts of Nursing diagnoses, outcomes and interventions oriented to specific areas of Nursing assistance that allow unifying the professional language and highlighting the elements that describe the practice[6].

Regarding the PICC in Neonatology, studies have been observed on the incidence of the complications related to the use of the catheter and the factors related to possible adverse events. The literature is emphatic in gathering information about good practices and measures to prevent complications related to the use of this device, as well as in analyzing the Nursing professionals' performance regarding PICC management. Comparative studies of the use of X-ray or ultrasound as the most effective technique for recognizing the ideal positioning of the catheter tip were also found in the databases, as well as research studies about the benefits or disadvantages of early catheter removal when compared to an expectant approach. All these productions aim at improving and supporting the techniques performed by nurses to guarantee safe assistance to the neonate[7–14]. Thus, a gap was observed in the literature about the development and validation of a terminology subset of the ICNP® for this clientele, guided by a Nursing theory, thus justifying conduction of this research.

In view of the importance of nurses as providers of assistance to neonates using PICCs, the proposal of a facilitating technological tool for a systematized practice, supported by a Nursing theory, will contribute to professional recognition arising from the record and quality of care in neonatal Nursing assistance in the care of these patients, showing the relevance of this study. Given the above, the aim of this study was to elaborate and validate the content of a terminology subset of the International Classification for Nursing Practice (ICNP®), in light of Betty Neuman's theoretical model, for newborns with a Peripherally Inserted Central Catheter.

METHOD

This is a methodological study, followed by content validation. The research was conducted in an NICU of a university hospital from northeastern Brazil. It observed the guidelines of the method for the elaboration of Terminology Subsets[15–16], following these stages: 1) Identification of clinical findings relevant to the Nursing practice from physical examinations with newborns in the NICU; 2) Cross-mapping of the findings identified with the ICNP® terms, version 2019/2020; 3) Elaboration of the statements regarding Nursing diagnoses, outcomes and interventions, based on Betty Neuman's theoretical model; and 4) Validation of the statements' content by expert nurses, using the Delphi Technique in two rounds.

In the first stage, the main researcher performed physical examinations on newborns who underwent PICC insertion in the period from January to December 2019, identifying 86 clinical findings, considered as "Stressors" according to Neuman's model. Sample calculation for finite populations was used with a sampling error of 10%, confidence level of 95% (Z_{∞}=1.96) and prevalence of 50%, thus constituting a sample of 124 neonates. Selection was by convenience in a consecutive manner, adopting the following eligible inclusion criteria: newborns admitted to the NICU who underwent PICC insertion during hospitalization and who remained in the unit until the end of the treatment. The exclusion criteria were as follows: transfer of the NB to another institution and loss of the venous catheter. The legal guardians accepted inclusion of the NBs in the research by signing the Free and Informed Consent Form (FICF).

In the second stage, the findings were imported into Microsoft Office Access® spreadsheets and submitted to the cross-mapping process with the terms of the Seven Axes Model of ICNP®, version 2019/2020. As a result of this crossing, 86 terms were obtained, thus constituting the study term base.

In the third stage, the statements of Nursing diagnoses/outcomes and interventions were elaborated, based on the terms identified. The recommendations set forth in ISO 18.104:2014 were taken into consideration. To elaborate the operational definitions, three stages were followed: literature review; concept meaning mapping; and operational definition assertion.

In the fourth stage, validation of the statements' content, a group of experts was selected by searching the *Lattes* Platform of the National Council for Scientific and Technological Development (CNPq). The nurses selected as specialists should have at least a Master's degree, work with the Nursing Process and/or the ICNP® and with a focus on Neonatology in assistance, teaching or research. Of the 45 selected specialists who met the inclusion criteria, 32 answered the questionnaire for the first Delphi round and 20 did so in the second round. Subsequently, a database was built using Microsoft Off*ice* Excel® with the respective Nursing diagnoses/outcomes and interventions, being distributed in charts and categorized according to Neuman's Model.

Thus, the nurses' duty was to evaluate if the assertions proposed were applicable to the patients. In case of disagreement, suggestions were asked for their adequacy to the reality of the Nursing practice. Invitations to participate were sent via email, with inclusion of the FICF. After this stage, the link to the electronic form was sent for completion, containing the following information:

characterization of the nurses and list of Nursing diagnoses/outcomes and interventions. It was proposed that return should be within 30 days.

The Content Validity Index (CVI) was used for data analysis. Indices were calculated for the scores assigned to the diagnoses/outcomes and interventions, based on a five-point Likert scale (1=not at all appropriate; 2=slightly appropriate; 3=appropriate; 4=very appropriate; 5=extremely appropriate), where statements with CVI values ≥ 0.80 were validated. The CVI was calculated by dividing the number of judges who evaluated the item as adequate by the total number of specialists.

For the global evaluation of the instrument, the calculation was performed through the ratio between the number of items considered suitable by the experts and the total number of items. Reliability of the agreement of the items in the judges' evaluation was also analyzed, using the *Kappa* Coefficient (*k*), indicated as a complement to the CVI. As an acceptance criterion, agreement > 0.61 was established for the *Kappa* coefficient and ≥ 0.80 for the CVI, both for the evaluation of each item and for the overall assessment of the subset[17–18].

RESULTS

The newborns were mostly male (62.96%), born through cesarean section (70.37%), with low birth weight (29.62%), and with mean APGAR scores of 6.46 and 8.52 in the first and fifth minutes of life, respectively. The mean time for PICC permanence was 14.8 days, varying from one to 56 days. The main indications for catheter insertion were antibiotic therapy (51.85%) and parenteral nutrition (29.62%). Regarding the clinical diagnosis, prematurity (93.51%) and respiratory diseases (82.40%) were the most prevalent.

Regarding the specialists, they were mostly female (92%), aged between 30 and 40 years old (75%), had a Master's degree in Nursing (60%), and worked in the hospital area (60%). The validation process took place between January and March 2020. Of the 34 Nursing diagnosis/outcome statements elaborated, 31 were validated for content, as they obtained CVI values ≥ 0.80, as presented in Chart 1. They were also categorized according to the levels of intra-personal (3.03%), inter-personal (3.03%) and extra-personal (93.93%) stressors (Chart 1). For the Nursing diagnosis/outcome statements elaborated, 160 interventions were devised, and 154 were validated regarding their content, presented in Chart 2.

Figure 1 represents a diagram of the stressors and of the primary, secondary and tertiary prevention strategies in newborns with Peripherally Inserted Central Catheters.

Chart 1 - Stressors, levels of the stressors, and CVI and *Kappa* values of the 2019/2020 ICNP® Nursing diagnoses/ outcomes in newborns with peripherally inserted central catheters. Natal, RN, Brazil, 2020. (n=124)

Stressor	Stressor Level	Nursing Diagnosis	Delphi 1	Delphi 2	Nursing Outcomes	Delphi 1	Delphi 2
			CVI/*Kappa*	CVI/*Kappa*		CVI/*Kappa*	CVI/*Kappa*
Coagulation disorder	Intra-personal	Risk of hemorrhage	0.812/0.756	1.00/1.00	Control of the risk of hemorrhage	0.808/0.712	1.00/1.00
Handling of the patient	Inter-personal	Agitation	0.804/0.826	1.00/1.00	Agitation, reduced	0.802/0.875	1.00/1.00
Intravenous puncture; Dressing exchange	Extra-personal	Pain	0.897/0.905	1.00/1.00	Pain control	0.869/0.963	1.00/1.00
Exposure to microorganisms in hospital environments	Extra-personal	Risk of infection	0.843/0.895	1.00/1.00	Control of the risk of infection	0.802/0.978	1.00/1.00
		Infection	0.899/0.900	1.00/1.00	Infection, absent	0.931/0.894	1.00/1.00
Exposure to low temperature	Extra-personal	Hypothermia	0.892/0.856	1.00/1.00	Control of hypothermia	0.844/0.856	1.00/1.00
		Thermoregulation, impaired	0.889/0.874	1.00/1.00	Thermoregulation, effective	0.843/0.896	1.00/1.00
		Bradycardia	0.801/0.751	1.00/1.00	Bradycardia, absent	0.845/0.729	1.00/1.00
Presence of the device; Catheter in peripheral location; High number of solutions infused through the catheter	Extra-personal	Edema	0.807/0.930	1.00/1.00	Edema, absent	0.896/0.974	1.00/1.00
		Hematoma	0.803/0.785	1.00/1.00	Hematoma, absent	0.885/0.927	1.00/1.00
		Skin integrity, impaired	0.889/0.875	1.00/1.00	Skin integrity, effective	0.821/0.869	1.00/1.00
		Trauma due to invasive device	0.997/0.995	1.00/1.00	Response to trauma due to invasive device, improved	0.993/0.960	1.00/1.00
		Tissue integrity, impaired	0.889/0.866	1.00/1.00	Tissue integrity, effective	0.884/0.951	1.00/1.00
		Peripheral tissue perfusion, impaired	0.853/0.863	1.00/1.00	Peripheral tissue perfusion, effective	0.837/0.871	1.00/1.00
		Risk of embolism	0.817/0.785	1.00/1.00	Control of the risk of embolism	0.804/0.796	1.00/1.00
		Risk of necrosis	0.801/0.862	1.00/1.00	Control of the risk of necrosis	0.801/0.896	1.00/1.00
		Function of the regulating system, impaired	0.806/0.735	1.00/1.00	Function of the regulating system, effective	0.803/0.789	1.00/1.00

Chart 1 - Cont.

Stressor	Stressor Level	Nursing Diagnosis	Delphi 1	Delphi 2	Nursing Outcomes	Delphi 1	Delphi 2
			CVI/*Kappa*	CVI/*Kappa*		CVI/*Kappa*	CVI/*Kappa*
Catheter insertion	Extra-personal	Vital sign(s), altered	0.814/0.862	1.00/1.00	Vital sign(s), at the normal limit	0.832/0.845	1.00/1.00
		Risk of impaired function of the nervous system	0.809/0.678	1.00/1.00	Control of the risk of function of the nervous system	0.812/0.720	1.00/1.00
		Risk of impaired function of the respiratory system	0.815/0.865	1.00/1.00	Control of the risk of function of the respiratory system	0.812/0.785	1.00/1.00
		Risk of ineffective tissue perfusion	0.832/0.851	1.00/1.00	Control of the risk of tissue perfusion	0.821/0.835	1.00/1.00
		Risk of impaired neurological condition	0.824/0.710	1.00/1.00	Control of the risk of neurological condition	0.819/0.752	1.00/1.00
Device location	Extra-personal	Risk of impaired cardiac function	0.806/0.865	1.00/1.00	Control of the risk of cardiac function	0.803/0.874	1.00/1.00
		Heart rate, impaired	0.816/0.786	1.00/1.00	Heart rate, effective	0.813	1.00/1.00
Use of sterile latex gloves	Extra-personal	Allergy to latex	0.812/0.650	1.00/1.00	Allergy to latex, controlled	0.806	1.00/1.00
Use of antiseptics	Extra-personal	Allergy	0.802/0.712	1.00/1.00	Allergy, absent	0.802	1.00/1.00
Drug administration	Extra-personal	Risk of allergy to the medication	0.807/0.965	1.00/1.00	Control of the risk of allergy to the medication	0.807/0.803	1.00/1.00
Presence of the device; Adverse events related to the PICC	Extra-personal	Complication associated with health care	0.853/0.850	1.00/1.00	Complication associated with health care, absent	0.857/0.715	1.00/1.00
Presence of hyperosmolar solution; infusion of different types of solutions	Extra-personal	Catheter obstruction	0.904/0.985	1.00/1.00	Catheter obstruction, absent	0.904/0.806	1.00/1.00
		Risk of adverse medication	0.804/0.754	1.00/1.00	Risk of adverse medication, absent	0.804/0.712	1.00/1.00
		Drug interaction, adverse	0.864/0.658	1.00/1.00	Adverse drug interaction, absent	0.861/0.785	1.00/1.00

Chart 2 - Content Validity Index of the 2019/2020 ICNP® Nursing interventions in newborns with peripherally inserted central catheters. Natal, RN, Brazil, 2020. (n=124)

Nursing Diagnosis/Outcome	Nursing Interventions	Delphi 1	Delphi 2
		CVI/*Kappa*	CVI/*Kappa*
Risk of hemorrhage/Control of the risk of hemorrhage	Identify risk of hemorrhage; monitor fluid output; monitor fluid balance (or water balance); manage bleeding; measure (or check) fluid output	0.895/0.952	1.00/1.00
Agitation/Agitation, reduced	Assess signs of agitation; gather data on the environment; assess the presence of noise; gather data on stress level; monitor pain; position patient; monitor vital signs; reduce noise; manipulate according to the need for care	0.837/0.896	1.00/1.00
Pain/Pain control	Implement pain management guide; monitor pain; position patient; administer pain medication; nurse-controlled analgesia; assess response to the medication; assess response to pain management (control)	0.856/0.963	1.00/1.00
Risk of infection/Control of the risk of infection	Invasive device site care; monitor signs and symptoms of infection; use aseptic technique; prevent infection; obtain data on signs and symptoms of infection	0.843/0.879	1.00/1.00
Infection/Infection, absent	Invasive device site care; monitor signs and symptoms of infection; use aseptic technique; prevent infection; obtain data on signs and symptoms of infection	0.989/0.997	1.00/1.00
Hypothermia/Control of hypothermia	Promote positive thermoregulation; obtain data on risk of negative thermoregulation; monitor body temperature; evaluate response to thermoregulation	0.893/0.869	1.00/1.00
Thermoregulation, impaired/ Thermoregulation, effective	Promote positive thermoregulation; obtain data on risk of negative thermoregulation; monitor body temperature; evaluate response to thermoregulation	0.826/0.863	1.00/1.00
Bradycardia/Bradycardia, absent	Measure (or check) heart rate; monitor heart condition; monitor physiological condition; obtain data on heart condition	0.803/0.987	1.00/1.00
Edema/Edema, absent	Invasive device site care; implement skin care regimen; maintain skin integrity; monitor fluid balance (or water balance); monitor tissue perfusion; measure (or check) fluid output	0.863/0.875	1.00/1.00
Hematoma/Hematoma, absent	Invasive device site care; implement skin care regime; maintain skin integrity; apply cold compress	0.896/0.863	1.00/1.00
Skin integrity, impaired/ Skin integrity, effective	Invasive device site care; implement skin care regime; maintain skin integrity	0.803/0.987	1.00/1.00
Trauma due to invasive device/Response to trauma due to invasive device	Invasive device care regime; perform safety measure; prevent mechanical injury	0.894/0.901	1.00/1.00

Chart 2 - Cont.

Nursing Diagnosis/Outcome	Nursing Interventions	Delphi 1	Delphi 2
Tissue integrity, impaired/ Tissue integrity, effective	Maintain skin integrity; monitor skin integrity; obtain data on skin integrity; skin care regime; treat skin condition	0.891/0.962	1.00/1.00
Peripheral tissue perfusion, impaired/Peripheral tissue perfusion, effective	Assess tissue perfusion; monitor tissue perfusion; obtain data on peripheral tissue perfusion	0.806/0.861	1.00/1.00
Risk of embolism/Control of the risk of embolism	Assess the presence of air in infusion device; manage symptoms of embolism; monitor blood oxygen saturation using pulse oximeter; prevent embolism; handle invasive device carefully; avoid infusion therapy in invasive device with resistance; evaluate invasive device removal	0.802/0.896	1.00/1.00
Risk of necrosis	Assess invasive device condition; treat skin condition; implement skin care regime; obtain data on the risk of ineffective tissue perfusion	0.801/0.979	1.00/1.00
Function of the respiratory system, impaired/Function of the respiratory system, effective	Measure (or check) invasive device; order (or request) examination from X-ray service; assess location of invasive device by examination; stabilize invasive device with dressing; prevent venous thrombosis	0.809/0.951	1.00/1.00
Vital sign(s), altered/Vital sign(s), at the normal limit	Identify physiological condition; monitor physiological condition; monitor vital signs	0.844/0.943	1.00/1.00
Risk of impaired function of the nervous system/Control of the risk of impaired function of the nervous system	Measure (or check) invasive device; order (or request) examination from X-ray service; assess location of invasive device by examination; monitor vital signs	0.807/0.868	1.00/1.00
Risk of impaired function of the respiratory system/Control of the risk of impaired function of the respiratory system	Measure (or check) invasive device; order (or request) examination from X-ray service; assess location of invasive device by examination; stabilize invasive device with dressing, monitor vital signs; monitor blood oxygen saturation using pulse oximeter; assess symptoms of dyspnea; assess heart rate; prevent shock; auscultate lungs; monitor blood oxygen saturation using pulse oximeter; monitor vital signs	0.803/0.962	1.00/1.00
Risk of ineffective tissue perfusion/Control of the risk of ineffective tissue perfusion	Monitor vital signs; monitor blood oxygen saturation using pulse oximeter; assess symptoms of dyspnea; assess heart rate; prevent shock	0.817/0.878	1.00/1.00
Risk of impaired neurological condition/Control of the risk of neurological condition	Measure (or check) invasive device; order (or request) examination from X-ray service; assess location of invasive device by examination; monitor vital signs	0.806/0.975	1.00/1.00

Chart 2 - Cont.

Nursing Diagnosis/Outcome	Nursing Interventions	Delphi 1	Delphi 2
Risk of impaired cardiac function/Control of the risk of impaired cardiac function	Measure (or check) invasive device; order (or request) examination from X-ray service; assess location of invasive device by examination; stabilize invasive device with dressing; monitor vital signs; monitor blood oxygen saturation using pulse oximeter; assess symptoms of dyspnea; assess heart rate; prevent shock	0.815/0.920	1.00/1.00
Heart rate, impaired/ Heart rate, effective	Measure (or check) invasive device; order (or request) examination from X-ray service; assess location of invasive device by examination; stabilize invasive device with dressing; monitor vital signs; monitor blood oxygen saturation using pulse oximeter; assess symptoms of dyspnea; assess heart rate; prevent shock	0.828/0.913	1.00/1.00
Allergy to latex/Allergy to latex, controlled	Identify allergy in the patient; avoid contact with latex; monitor skin integrity	0.804/0.862	1.00/1.00
Allergy/Allergy, absent	Identify allergy in the patient; identify allergy at the patient's bedside	0.827/0.875	1.00/1.00
Risk of allergy to the medication/Control of the risk of allergy to the medication	Confirm (or verify) allergy; evaluate medication list; evaluate need for laboratory test; report to physician; evaluate need for diagnostic test	0.832/0.950	1.00/1.00
Complication associated with health care/ Complication associated with health care, absent	Perform safety measure; promote hand hygiene; use aseptic technique; evaluate dressing; implement invasive device care regime; monitor signs and symptoms of infection	0.808/0.978	1.00/1.00
Catheter obstruction/Catheter obstruction, absent	Evaluate invasive device; flush invasive device with isotonic solution; implement regime to flush invasive device before and after medications	0.899/0.961	1.00/1.00
Risk of adverse medication/Risk of adverse medication, absent	Implement safety regime; manage medication's side effect risk; obtain data on risk of adverse drug interaction	0.813/0.987	1.00/1.00
Adverse drug interaction/Adverse drug interaction, absent	Evaluate medication list; consult pharmacist about medication list; consult health care provider about medication's side effects; obtain data about medication's side effects; change medication schedule according to multiprofessional guidance	0.816/0.915	1.00/1.00

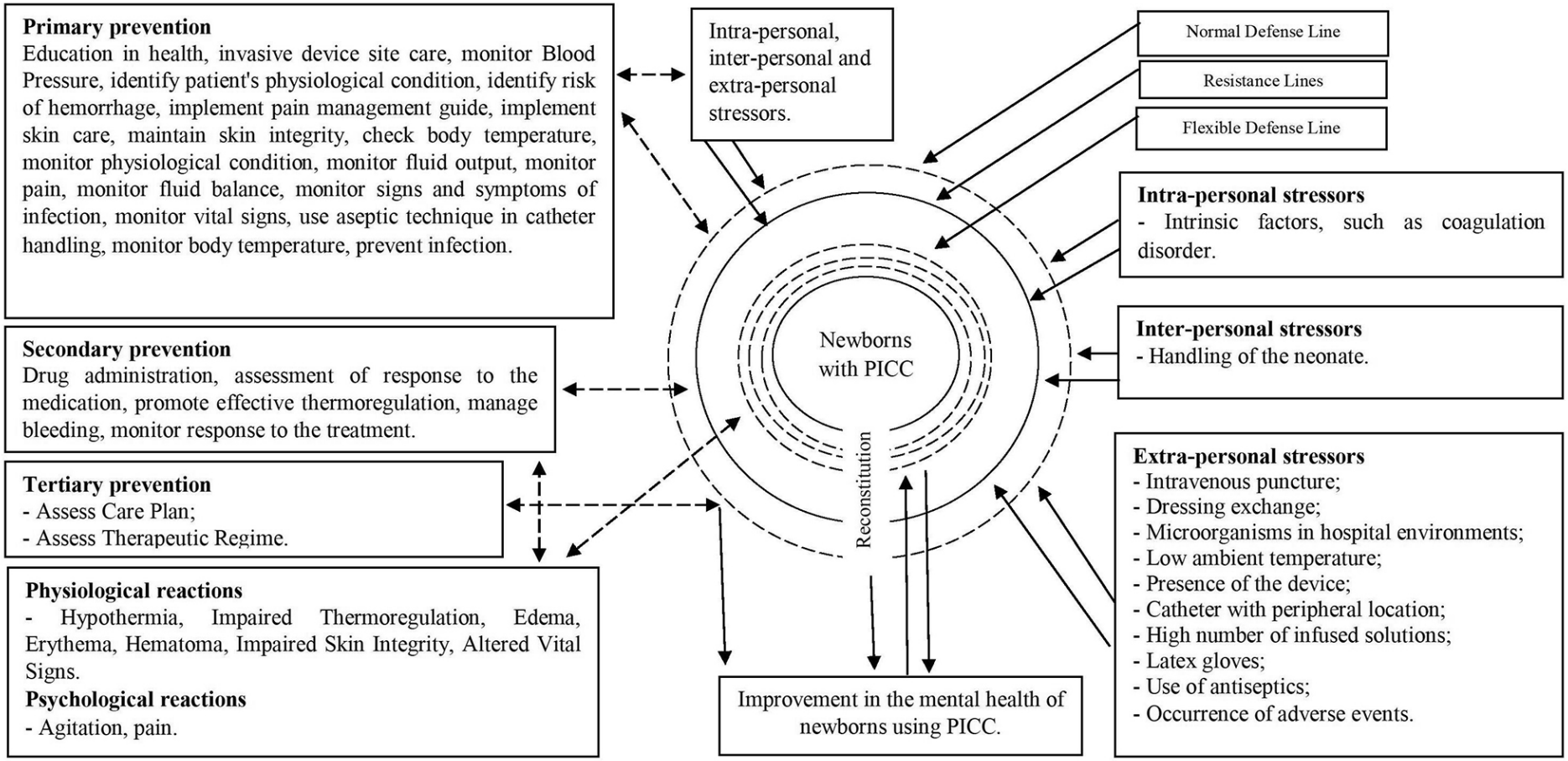

Figure 1 - Diagram corresponding to the stressors and to the primary, secondary, and tertiary prevention strategies in newborns with a Peripherally Inserted Central Catheter. Natal/RN, Brazil, 2020. (n=124)

DISCUSSION

Regarding the Nursing diagnoses validated in this study, specifically related to the intra-personal stressors, “Risk of Hemorrhage” was identified. As a base stressor for this diagnosis, there are factors that are intrinsic to the newborn, such as coagulation disorder. Among the coagulation disorders, thrombocytopenia in the neonatal period is a hematological abnormality that is frequently found and which affects between 20% and 35% of all newborns in intensive care[19].

Corroborating the findings of this study, bleeding during the PICC insertion procedure was one of the main complications in a study that analyzed use of the catheter[9]. Hemorrhage can generate consequences with different levels of severity. The interventions listed for the diagnosis in question include the following: identify risk of hemorrhage; monitor fluid output; monitor fluid balance (or water balance), manage bleeding; and measure (or check) fluid output.

Handling of the premature newborn by the professional was considered as an intra-personal base stressor for the “Agitation” diagnosis. Handling of the premature infant can compromise well-being balance and interfere with the emergence of sequelae in the neurobehavioral development, such as manifestations of stress, pain, and physiological and behavioral changes[20].

Regarding the extra-personal stressors, intravenous puncture, dressing exchange, exposure to microorganisms in hospital environments, exposure of the NB to low temperature, presence of the device inside the vessel, poorly positioned catheter and high amount of solutions infused through the catheter were determining factors for the elaboration of the “Pain”, “Risk of Infection”, “Hypothermia”, “Impaired Thermoregulation”, “Edema”, “Erythema”, “Hematoma”, “Impaired Skin Integrity” and “Altered Vital Signs” diagnoses.

Painful manifestations are frequent in Neonatal Intensive Care[10]. In an international study conducted with 101 newborns, with gestational ages between 24 and 40 weeks, occurrence of nearly eight painful procedures per day was found, a reality verified at the national level, where a study with 150 newborns pointed out 6.6 invasive procedures per day[21].

Pain expression can be characterized by behavioral changes and facial expressions, such as: crying, excessive limb movement, increased heart rate, and decreased oxygen saturation[22]. The long-term consequences are delayed growth and neurological development, as well as cognitive and motor deficits[10].

Handling during catheter insertion and the pain caused by the intravenous puncture are factors that trigger agitation in neonates using PICCs. The interventions listed for the “Agitation” and “Pain” diagnoses were as follows: implement pain management guide, monitor pain, position patient, administer pain medication, nurse-controlled analgesia, assess response to medication, and assess response to pain management (control)[23].

The adoption of team training and the use of protocols based on scientific evidence focusing on the reduction of pain symptoms are also necessary[24]. Allied to this, the minimal handling therapy, which emphasizes the grouping of procedures to be performed at the same time, avoids excessive handling of the premature, providing sleep, rest, and stress reduction[25].

Regarding “Risk of Infection”, in the newborn population, the risk is increased due to the fragility of the protective barriers, such as the skin and mucosa, as well as of the immune system[26]. Invasive device site care and monitoring signs and symptoms of infection were interventions listed for the “Risk of Infection” diagnosis in NBs with epicutaneous catheters.

Regarding the “Hypothermia” and “Thermoregulation, Impaired” diagnoses found in this research, they had exposure to low temperature as a stressor. Hypothermia is considered as an independent risk factor for bad prognoses in newborns. The literature points to an association between hypothermia and increased mortality in premature newborns[27]. A national study showed a considerable number of

children (75%) who presented hypothermia after the insertion procedure for the Peripherally Inserted Central Catheter[28].

Therefore, Nursing care aimed at preventing hypothermia is necessary[27]. This study listed data acquisition on the risk of negative thermoregulation, monitoring body temperature, and assessing the response to thermoregulation as measures to reduce the risk of hypothermia.

Presence of the catheter in the venous bed, catheter positioned in a peripheral location, and high amount of solutions infused through the device were considered stressors for the "Edema", "Hematoma" and "Skin Integrity, Impaired" diagnoses. Edema is a type of vascular trauma resulting from a lesion in the vein layers, resulting in the infiltration of solutions or drugs into the tissues proximal to the insertion of the intravenous catheter[29].

In an international study, limb edema was identified as a complication associated with use of the catheter[11]. Edema is one of the factors associated with non-elective removal of the device, and is responsible for one of the factors related to unscheduled catheter removal[12].

The ICNP® points out important interventions to prevent and treat edema, such as: implementing device site care, implementing skin care regime, maintaining skin integrity, and monitoring fluid infusion.

Another diagnosis identified was "Hematoma", which is characterized by the accumulation of blood retained in the tissues and is associated with impaired vascular process, that is, associated with injury to blood vessels by venipuncture where transfixation of the vessel occurs with extravasation of blood[23].

Hematoma is one of the main local complications present in patients using venous access[13]. In this sense, actions to reduce the risk of this diagnosis should be implemented, especially in vulnerable populations such as critically-ill newborns.

The "Skin Integrity, Impaired" diagnosis was also listed, which occurs when the epidermis and/or dermis suffer some type of damage. The newborn's skin is sensitive, thin and fragile. When associating these properties with the immaturity of the systems, the use of hospital devices, and the use of films to correct catheters, there is an increase in the risk of skin damage[30]. From this perspective, the ICNP® presents the following strategies for the NB with the Impaired skin integrity ND: maintaining invasive device site care, implementing skin care regime, and constantly seeking to maintain skin integrity.

Another diagnosis identified in this research was "Vital Sign(s), Altered", with PICC insertion as a base stressor. When subjected to stressful events, the NB can present disorganization of the different systems, thus contributing to changes in the physiological parameters[1]. Added to this, during a stressful situation, the newborn can present changes in systemic blood pressure, heart rate (HR), respiratory rate (RR) and peripheral oxygen saturation (SpO2)[25].

In order to prevent stress, primary level interventions act to strengthen the flexible defense line through prevention and reduction of risk factors[4]. In this sense, it is worth mentioning continuing education actions for professionals, invasive device site care, identification of risks inherent to the patient's physiological conditions, implementation of course of action guides, continuous monitoring of the skin and maintenance of its integrity, promotion of effective thermoregulation, and use of aseptic technique from device insertion until the moment of its removal.

Interventions at the secondary level seek to reduce the deleterious effects in response to the stressor[4]. This occurs, for example, when the nurse administers medications for pain relief, manages infused solutions, obtains data on signs and symptoms of infection, and monitors response to the treatment.

Tertiary prevention refers to the adjustment processes for reconstitution of the system with the aim of continuing the interventions initiated at the secondary level, strengthening resistance to the stressors and preventing the evolution of signs and/or symptoms[4]. Thus, constant evaluation of the care plan is a fundamental stage in the care of NBs with PICCs.

The study limitations refer to the fact that the Nursing diagnoses/outcomes and interventions developed apply to the reality of hospitalized newborns in a single NICU.

CONCLUSION

This study allowed elaborating and validating a terminology subset of the ICNP® for newborns with PICCs, composed of 31 Nursing diagnoses/outcomes and of 154 Nursing interventions. The use of Neuman's theoretical model configured a conceptual-philosophical foundation that provided a re-reading of this practice in the perspective of directing the clinical evaluation to the identification of stressors and statements.

The research presents considerable contributions for Nursing, since it assisted in improving the NP in Newborns using PICCs. The identification of clinical findings through physical examinations stands out as a potentiality of this research, since it reflects particularities of the Nursing care directed to this population. The validation of the statements corresponding to the ICNP® Nursing diagnoses/outcomes and interventions in the study population contributes to the standardization of a professional language and to the development of the Nursing science, in addition to providing subsidies for teaching and permanent education, with a focus on patient safety.

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NOTES

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Study design: Prado NCC, Silva RAR.
Data collection: Prado NCC.
Data analysis and interpretation: Prado NCC, Silva RAR.
Discussion of the results: Prado NCC, Silva RAR, Lima DM, Silva ABP, Mercês BMO, Menezes HF.
Writing and/or critical review of the content: Prado NCC, Silva RAR, Lima DM, Silva ABP, Mercês BMO, Menezes HF.
Review and final approval of the final version: Prado NCC, Silva RAR, Lima DM, Silva ABP, Mercês BMO, Menezes HF.

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CONFLICT OF INTEREST

There is no conflict of interests.

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CORRESPONDING AUTHOR

Nanete Caroline da Costa Prado
caroline_k16@hotmail.com