

Development of a checklist for neonatal perioperative care in cardiac surgery

Desenvolvimento de *checklist* para assistência perioperatória neonatal em cirurgia cardíacaElaboración de *checklist* para la atención perioperatoria neonatal en cirugías cardíacasMáriele Gobo de Oliveira¹  <https://orcid.org/0000-0002-0780-965X>Mariana Aparecida de Jesus Castro Santos¹  <https://orcid.org/0000-0001-9205-4644>Nyara Coelho Carvalho¹  <https://orcid.org/0000-0002-2551-4265>Ana Lúcia Monaro Barboza²  <https://orcid.org/0000-0001-7196-8957>José Fausto de Morais³  <https://orcid.org/0000-0002-0808-0477>Silmara Meneguín¹  <https://orcid.org/0000-0003-3853-5134>

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Descritores

Lista de checagem; Enfermagem neonatal; Cardiopatias congênitas; Unidades de terapia intensiva neonatal; Cuidados de enfermagem; Cirurgia torácica; Assistência perioperatória

Descriptores

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Corresponding author

Máriele Gobo de Oliveira
E-mail: mariele.gobo@unesp.br

Associate Editor

Denise Myuki Kusahara
(<https://orcid.org/0000-0002-9498-0868>)
Escola Paulista de Enfermagem, Universidade Federal de São Paulo, São Paulo, SP, Brazil

Abstract

Objective: To build and validate checklist content for neonatal perioperative nursing care in cardiac surgery.

Methods: This is methodological research, developed from October 2020 to September 2021, in two sequential stages: checklist item construction based on an integrative literature review and content validity by seven experts in neonatology, selected from a search in resumes. For analysis, the Content Validity Index was used, considering values ≥ 0.8 .

Results: A checklist was created with 57 structured items for pre-, intra- and postoperative interventions in cardiac surgery, with care actions designated according to the legal competence of nursing professional (technician and nurse) categories. In the validity process, 24 items were modified and four were excluded. The minimum level of agreement among experts for the items was 0.86, except for one item (0.75).

Conclusion: The checklist achieved content validity with a satisfactory standard for use in the perioperative period of cardiac surgery.

Resumo

Objetivo: Construir e validar conteúdo de *checklist* para assistência de enfermagem perioperatória neonatal em cirurgia cardíaca.

Métodos: Pesquisa metodológica, desenvolvida no período de outubro de 2020 a setembro de 2021, em duas etapas sequenciais: construção dos itens do *checklist* a partir de revisão integrativa da literatura e validação de conteúdo por sete especialistas em neonatologia, selecionados a partir de busca curricular. Para análise, utilizou-se o índice de validade de conteúdo, considerando valores $\geq 0,8$.

Resultados: Construiu-se um *checklist* com 57 itens estruturado para intervenções no pré, intra e pós-operatório de cirurgia cardíaca, com ações assistenciais designadas de acordo com a competência legal das categorias dos profissionais de enfermagem (técnico e enfermeiro). No processo de validação, 24 itens foram modificados e quatro excluídos. O nível de concordância mínimo entre os especialistas para os itens foi de 0,86, exceto para um item (0,75).

Conclusão: O *checklist* alcançou validade de conteúdo com padrão satisfatório para utilização no perioperatório de cirurgia cardíaca.

Resumen

Objetivo: Elaborar y validar el contenido de una *checklist* para la atención de enfermería perioperatoria neonatal en cirugías cardíacas.

¹Department of Nursing, Faculdade de Medicina de Botucatu, Universidade Estadual Paulista "Júlio de Mesquita Filho", Botucatu, SP, Brazil.

²Hospital das Clínicas, Faculdade de Medicina de Botucatu, Universidade Estadual Paulista "Júlio de Mesquita Filho", Botucatu, SP, Brazil.

³School of Mathematics, Universidade Federal de Uberlândia, Uberlândia, MG, Brazil.

Conflicts of interest: nothing to declare.

Métodos: Estudio metodológico, llevado a cabo durante el período de octubre de 2020 a septiembre de 2021, en dos etapas secuenciales: elaboración de los ítems de la *checklist* a partir de una revisión integradora de la literatura y validación del contenido por siete especialistas en neonatología, seleccionados mediante una búsqueda curricular. Para el análisis, se utilizó el índice de validez de contenido, considerando valores $\geq 0,8$.

Resultados: Se elaboró una *checklist* con 57 ítems, estructurada para realizar intervenciones en el pre, intra y posoperatorio de cirugías cardíacas, con acciones asistenciales designadas de acuerdo con la competencia legal de las categorías de los profesionales de enfermería (técnico y enfermero). En el proceso de validación, se modificaron 24 ítems y se eliminaron cuatro. El nivel de concordancia mínimo entre los especialistas en los ítems fue de 0,86, con excepción de un ítem (0,75).

Conclusión: La *checklist* obtuvo validez de contenido satisfactoria para la utilización en el perioperatorio de cirugías cardíacas.

Introduction

Congenital heart defects are malformations observed at birth, resulting from a multifactorial interaction associated with genetic and environmental factors, which are subdivided into two groups: cyanotic and acyanotic.⁽¹⁾ Despite divergent variations in population studies, its prevalence is similar throughout the world, affecting approximately 1% of live births, being the main cause of mortality from birth.⁽²⁾ In Brazil, a population study with 10,594 cases found a prevalence of 12.4/10,000 live births.⁽³⁾

Most cases may require hospitalization and admission to Intensive Care Units (ICUs). A study carried out in Amazonas, with newborns and adolescents, showed that in 70.5% of cases there was a need for transfer to the ICU.⁽⁴⁾ Hospitalizations are necessary not only for the pathology itself, but for associated complications, such as respiratory system impairment and prematurity. Those with congenital heart disease have an 18.1% incidence of prematurity, whereas those without, 8.4%.⁽⁵⁾ In this scenario, Neonatal Intensive Care Units (NICUs) provide specialized care for high-risk newborns aged between 0 and 28 days.

When faced with a diagnosis of congenital heart disease, nursing care must be early and safe, aiming to maintain patient stability and hemodynamic compensation.⁽⁶⁾ The care provided is, on average, 17.5 hours of direct assistance to each patient in 24 hours, calculated by the Nursing Activities Score, and the lower the gestational age and weight, the greater the workload for the nursing team, given the need for attention to this patient.⁽⁷⁾

Furthermore, approximately 25% of patients with congenital heart disease will require surgical intervention within the first year of life.⁽⁸⁾ Postoperatively, care is crucial for prognosis, requir-

ing careful and rigorous monitoring, due to the fact that a large number of cardiac surgeries require extracorporeal circulation, which triggers physiological changes, increasing the risk of complications.⁽⁹⁾ Additionally, for recovery after surgical intervention, it is necessary to consider the high risk that newborns have for adverse events, the main causes of which are inadequate medication management, healthcare-associated infections (HAIs), invasive procedures, among others.⁽¹⁰⁾

However, there is divergence between services in relation to neonatal cardiac care, suggesting the need to establish standards, with continuous improvement processes.⁽¹¹⁾ The development and implementation of instruments that guide processes, such as protocols and checklists, have been recurrent with the aim of offering safer care and reducing harm to patients, as they are based on valid scientific evidence.⁽¹²⁾

Thus, considering the scarcity of studies on the approach to newborns undergoing cardiac surgery, with an emphasis on the nursing team role in neonatal intensive care, it is believed that implementing a checklist that highlights the assistance provided, the equipment and materials used, in addition to the role of each nursing professional, can significantly impact care safety, avoiding adverse events. Therefore, this study aimed to develop a checklist for cardiac perioperative neonatal nursing care in an ICU.

Methods

This is a methodological study, carried out according to Pasquali's psychometric framework⁽¹³⁾ from October 2020 to September 2021, in a public hospital in the countryside of São Paulo. It was devel-

oped in two stages: checklist item construction and content validity by experts.

Stage 1 - Checklist item construction

This stage began with an integrative literature review, prepared according to the international guide Preferred Reporting Items for Systematic Reviews and Meta-Analyses for Scoping Reviews (PRISMA-ScR) recommendations.⁽¹⁴⁾ The databases used were LILACS, BDENF, PubMed and CINAHL, with the descriptors Neonatal Nursing, Congenital Heart Diseases, Neonatal Intensive Care Units, Nursing Care, Thoracic Surgery. These descriptors combined resulted in the strategies: (Neonatal Nursing (OR) Neonatal Intensive Care Units (OR) Nursing Care (AND) Congenital Heart Diseases OR Thoracic Surgery), (Neonatal Nursing (OR) Intensive Care Units, Neonatal (OR) Nursing Care (AND) Heart Defects, Congenital (OR) Thoracic Surgery) and (Neonatal Nursing (OR) Neonatal Intensive Care Units (OR) Nursing Care (AND) Congenital Cardiopathy (OR) Thoracic Surgery).

Articles published between 1999 and 2019, in Portuguese, English and Spanish, that answered the guiding question “what are the fundamental nursing care in perioperative care for heart disease patients in an ICU?” were considered eligible. Articles not available to read in full were excluded.

Initially, 417 articles were found. After excluding duplicates, 63 studies were selected for title and abstract reading: 49 articles in LILACS, two in BDENF, three in PubMed and nine in CINAHL. Of these, 37 were excluded for not meeting the inclusion criteria and 26 studies were selected for full reading. After excluding three for not meeting the guiding question, 23 articles were selected to create the checklist (Chart 1). Subsequently, other sources were consulted, such as books and studies from the collection of governmental and non-governmental bodies, such as ordinances from the Ministry of Health, SOBEP (Brazilian Society of Pediatric Nurses) and the Federal Nursing Council, for consultation on the functioning of units of neonatal therapy, neonatal care and legal exercise of nursing professions.

Studies eligible for full reading were identified by an independent reviewer, following the proposed eligibility criteria. Conflict resolution included a second reviewer. The same process occurred to extract relevant information from articles selected in the final sample. The data extraction form included the study characteristics, aiming at relevant care for patient safety during surgery.

After selecting abstracts, selected articles were read in full. With care data extraction, items were prepared based on the literature and actions recommended for neonatal care, considering the perioperative period (pre, intra and post), with the provision of care actions according to the nursing professional category (whether technician or nurse), according to the legal competencies established for working in the NICU. Item organization had as a theoretical framework the concept of nursing care management,⁽³⁸⁾ which consists of the articulation between the management and care dimensions in the work process.

Stage 2 - Checklist item content validity

Experts in neonatology and/or researchers with experience in building instruments in the health sector were invited to join the group of judges, selected through a curricular search on the Brazilian National Council for Scientific and Technological Development (CNPq - *Conselho Nacional de Desenvolvimento Científico e Tecnológico*) *Plataforma Lattes*, who had a minimum score five points in Fehring criteria,⁽³⁹⁾ namely: master's degree in the field of nursing or medicine; master's degree in neonatology; recent clinical practice of at least one year in the area of neonatology; doctoral degree in nursing or medicine with a thesis in the area; published research in the area; specialization or studying in neonatology.

An initial invitation was formal, through an invitation letter sent by email or cell phone text message presenting the objectives. Initially, 14 judges agreed to participate and an email was sent with instructions for the validity process. The data collection instrument consisted of two parts: 1) judge characterization, ensuring participation anonymity; 2) content analysis of each instrument item based

Chart 1. Articles selected for checklist construction

Author, year, country	Study design	Main objectives	Relevant topics analyzed
Grebinski ⁽¹⁵⁾ , 2019, Brazil	Cross-sectional study	Measure the nursing team workload and size the staff.	Nursing schedule sizing.
Hoffmeister ⁽¹⁶⁾ , 2019, Brazil	Cross-sectional study	Analyze reported incidents in a neonatal care unit.	Care in patient identification, use of medications and devices.
Ribeiro ⁽¹⁷⁾ , 2018, Brazil	Exploratory descriptive study	Identify equipment failures during handling and conduct by nurses.	Assembly and checking of technological equipment to avoid incidents.
Chaves ⁽¹⁸⁾ , 2017, Brazil	Reflective study	Reflect on nursing supervision as a nurse's management tool for comprehensive care.	Nurse's care and supervisor role on the team.
Schena ⁽¹⁹⁾ , 2017, Italy	Multicenter clinical study	Assess the effectiveness of newborn screening combined with pulse oximetry and perfusion index for severe congenital heart defects.	Verification of pre- and post-cordial oximetry in cyanotic heart disease.
Pimenta ⁽²⁰⁾ , 2016, Brazil	Exploratory descriptive study	Know the conditions under which the inter-hospital transport of high-risk newborns takes place.	Safe conditions for neonatal transport.
Silva ⁽²¹⁾ , 2016, Brazil	Exploratory descriptive study	Understand professionals' perception of communication during shift changes and its impact on patient safety.	Use of clear and structured language when changing shifts.
Justice ⁽²²⁾ , 2015, USA	Guideline	Guidelines to be used as a bedside resource to assist in treating complications of congenital heart disease.	Postoperative monitoring.
Piggott ⁽²³⁾ , 2015, USA	Retrospective cross-sectional study	Assess the incidence and risk factors for the development of AKI in newborns after surgery for congenital heart disease.	Carrying out water balance in the first hours after surgery.
DeSena ⁽²⁴⁾ , 2015, USA	Review study	Discuss strategies for reducing length of stay in postoperative care for congenital heart disease.	Control of blood glucose and fluid balance in the postoperative period.
Melo ⁽²⁵⁾ , 2012, Brazil	Qualitative study	Understand care in the immediate postoperative period of cardiac surgery from the perception of being a nurse.	Cross-functional role of nurses pre-, intra- and postoperatively, with support from family members.
Solberg ⁽²⁶⁾ , 2012, Norway	Pilot study, with pre and post testing	Implement a didactic model and assess nurses' self-assessments after observing children with heart disease, before and after participating in the program.	Clinical characteristics to be assessed by nurses.
Monteiro ⁽²⁷⁾ , 2012, Brazil	Review study	Analyze nursing practices in the literature in the postoperative period of cardiac surgery.	Hemodynamic monitoring.
Torowicz ⁽²⁸⁾ , 2012, USA	Review study	Review the process of implementing a care model in a cardiac ICU.	Patient positioning in the postoperative period.
Pagowska-Klimek ⁽²⁹⁾ , 2011, Poland	Retrospective observational study	Examine the perioperative determinants of prolonged intensive care length of stay after cardiac surgery.	Warning signs in the pre, intra and postoperative periods.
Sadowski ⁽³⁰⁾ , 2009, USA	Review study	Cover everything from pathogenesis to congenital heart disease management.	Postoperative implications: warning signs, use of invasive blood pressure, device positioning.
Mélio ⁽³¹⁾ , 2008, Brazil	Qualitative study	Understand the typical actions of companions during cardiac surgery outpatient care.	Communication with the family member/companion.
Bueno ⁽³²⁾ , 2008, Brazil	Retrospective cross-sectional study	Check the frequency of pharmacological analgesic coverage and the occurrence of postoperative pain after heart disease.	Administration of drugs correctly in the postoperative period.
Ascenzi ⁽³³⁾ , 2007, USA	Review study	Discuss the current options available for postoperative complications seen after complex congenital heart disease surgery.	Use of nitric oxide in the postoperative period, in cases of pulmonary hypertension.
Ireland ⁽³⁴⁾ , 2006, USA	Review study	Address pediatric surgical patients' specific concerns.	Preoperative routine: fasting, laboratory tests, medications.
Bekke ⁽³⁵⁾ , 2005, USA	Review study	Discuss multisystemic risk factors and consequences associated with cardiopulmonary bypass and cardiac surgery, and postoperative management.	Thermoregulation.
Parkman ⁽³⁶⁾ , 2005, USA	Exploratory descriptive study	Describe a population of infants undergoing cardiac surgery and the relationship between the presence of complications and other variables.	Expected postoperative outcomes.
Andrade ⁽³⁷⁾ , 2004, Brazil	Qualitative study	Identify the factors that interfere with communication, and its lack, during shift change.	Need to systematize shift handovers.

USA: United States of America; AKI: acute kidney injury, ICU: Intensive Care Unit.

on clarity, relevance, pertinence and comprehensiveness, using a Likert-type scale, with a score from 1 to 4.⁽⁴⁰⁾ Clarity assesses the writing, whether the concept can be well understood and adequately expresses what it is expected to measure. Relevance aims to assess whether there is a relationship with the concepts involved and whether it is relevant to achieving the proposed objectives.⁽⁴¹⁾ Relevance indicates how much an item represents the content being measured, and comprehensiveness shows whether the instrument encompasses all items related to what it wants to measure.⁽⁴²⁾ To assess items,

the following options were considered: 1 = unclear/not relevant; 2 = somewhat clear/somewhat relevant; 3 = very clear/very relevant; 4 = really clear/really relevant, with open spaces for suggestions and comments.

Data were initially analyzed using descriptive statistics (absolute and relative frequencies, minimum, maximum, mean, median and standard deviation). To validate checklist content and appearance, the scores attributed to each item in judges' assessments were verified. Data analysis was carried out by calculating the Content Validity Index

(CVI), by calculating the sum of the agreement of items that had answers with grades 3 and 4, divided by the number of experts. For each item assessed to be considered adequate, a minimum value of 0.80 was accepted.⁽⁴³⁾ Items that received a score of “1” or “2” were revised or eliminated, considering judges’ suggestions for changes.

To assess the instrument, the overall CVI was performed, using the means of the values of assessed criteria, calculated separately, through the sum of the CVI values of each item and dividing by the number of items considered, within each criterion.⁽⁴⁴⁾

The study was approved by the Research Ethics Committee under Opinion 4,783,087, and the Informed Consent Form was digitally signed by all participants (Certificate of Presentation for Ethical Consideration 33587320.7.0000.5411).

Results

In stage 1, the results from the literature review were categorized into two dimensions: management (actions related to organization of service for patient care, performed by nurses) and assistance (patient care actions carried out directly by the nursing team, technicians and nurses, depending on the complexity of care).

The checklist was structured with 57 items in three parts: pre, intra and postoperative and with care actions designated according to the nursing professional (nurse or technician) category for better understanding and applicability by the target audience. The preoperative phase addresses welcoming actions and information to family members/caregivers about the need to perform the procedure and preparing patients for referral to the operating room (OR). It consists of 23 items, 14 items inherent to nurses’ actions and nine items to nursing technicians.

The intraoperative phase comprises NICU nursing team actions while patients remain in the OR, under the responsibility of a surgical team. In this phase, 11 items were constructed, eight items referring to the functions performed by nurses and

three items referring to nursing technicians, which cover setting up the bed and checking equipment that newborns will need after the end of a surgical procedure and upon returning to the NICU.

For the postoperative period, 23 items were created, 16 referring to nurses’ actions and seven items to nursing technicians’ actions, detailing the procedures necessary to receive newborns in the NICU.

Of the 14 judges invited to participate in checklist content and face validity, only seven accepted the invitation and answered the assessment instrument. Of these, the majority were nurses (71.4%), with a mean of 10.8 years of clinical experience and expert and master’s degree holders (85.7%). Of the 57 items, only item nine from the preoperative phase, which addressed the transport incubator functionality, presented a CVI < 0.8 (0.75) in the relevance and scope criteria, and was modified. Among the other items, the minimum level of agreement was 0.86 among judges, with the checklist having an overall CVI of 0.98. Table 1 shows the CVI for each phase and the number of items built, modified and excluded.

Table 1. Content Validity Index according to the criteria assessed by judges for checklist items

Phases	CVI*				Items n(%)		
	C	R	P	S	Constructed	Modified	Excluded
Preoperative	0.98	0.98	0.96	0.96	23(40.3)	16(28.0)	-
Intraoperative	0.98	0.98	0.98	0.98	11(19.2)	4(7.0)	2(3.5)
Postoperative	0.98	0.98	0.98	0.98	23(40.3)	4(7.0)	2(3.5)
Overall	0.98	0.98	0.97	0.97	57(100)	24(42.1)	4(7.0)

*Average Content Validity Index (CVI); C – clarity; R – relevance; P – pertinence; S – scope

At the end of validity, 24 items were modified and four excluded, totaling 53 checklist items. Of the excluded items, two from the intraoperative phase addressed actions relevant to the OR nursing team and two from the postoperative phase addressed transport incubator use and were excluded due to their non-use. When analyzing content validity, the results proved to be valid, with an overall CVI of 0.98. All suggestions made by the committee of judges resulted in changes to the items, even if validated, totaling 42.1% of modifications. All modifications made are listed in Chart 2.

Chart 2. Synthesis of checklist items, highlighting the modifications made, in accordance with experts' suggestions

Preoperative phase (Initial item)	Modified item
1. Check the date and time of the surgical procedure, through direct contact with the OR, to confirm the appointment and/or doctor in charge of the surgery.	Check the surgical procedure schedule with the medical team and wait for contact from the OR to transport it.
2. Guide family members/caregivers regarding the surgical procedure to be performed with patients, clarifying doubts relevant to their area of expertise and referring the family member to dialogue with the surgeon.	Inform family members/caregivers about the procedure that will be performed with patients.
3. Schedule a daily shift with two nursing technicians for the day of the heart surgery.	Schedule a daily shift with two nursing technicians and a nurse, when possible, to [...]
5. Check fasting time, paying attention to signs of hypoglycemia (sweating, paleness and tachycardia) using the hemoglycotest (HGT).	Check fasting time and perform the blood glucose test (HGT) as prescribed by your doctor.
9. Check the functionality of the transport incubator, keeping it plugged in to check its temperature, which will be indicated on the side panel, ideally between 36.5 and 37°C.	Check the heated crib functionality, keeping [...]
10. Check the need to refill the O ₂ torpedo for transport, requiring replacement with a pressure gauge indicating less than or equal to 50mmHg	Check the need to refill the oxygen torpedo for transport, giving preference to the full torpedo (> or = 150mmHg).
11. Prepare transport incubator with mattress, swaddle, pillow, support for infusion pumps, transport monitor and transport fan.	Prepare a heated crib with [...] and transport ventilator/manual resuscitator.
12. Accommodate patients in the transport incubator, maintaining multiparametric monitoring, continuous infusion pumps positioned safely and offering oxygen when necessary.	Accommodate patients in a heated crib while [...]
13. Transport patients to the OR accompanied by the doctor, a nurse and a nursing technician.	Transport patients to the OR accompanied by at least a doctor and a nurse.
14. Pass patients' clinical conditions to the operating room nurse, informing patients' name, age, vital signs, breathing pattern, devices present and medications in continuous infusion pumps.	Pass patients' clinical conditions [...] medications on continuous infusion pump and voltage of the heated crib.
15. Perform routine multiparametric monitoring, control of vital signs every two hours and care with dressings.	Perform routine multiparametric monitoring, control of vital signs and other care according to the unit's routine
16. Organize the bed by arranging hospital medical equipment in an organized and easy-to-handle manner.	Organize the bed by arranging hospital medical equipment in an organized and easy-to-handle manner, preferably in an exclusive room, with double bed rails (for installing all equipment and medical gases).
20. Fasting according to medical prescription, paying attention to hypoglycemia.	Fasting according to medical prescription, observing the occurrence of changes in blood glucose.
21. Assist in preparing the transport incubator.	Assist in preparing the heated crib.
22. Position the transport case at the bottom of the incubator.	Position the carrying case [...] of the heated crib.
23. Assist in transporting patients to the OR.	Assist in transporting [...] if necessary.
Intraoperative phase	
4. Supervise the head of the bed, which must contain: O ₂ flowmeter, O ₂ reducing valve, compressed air flowmeter, compressed air reducing valve, suction valve with complete circuit and previously tested bag-valve-mask.	Check the head of the bed, which must contain O ₂ and compressed air flow meters, O ₂ and compressed air reducing valves, a suction bottle with a complete circuit and a valve-mask bag previously tested and connected to the flow meter.
5. Prepare the invasive blood pressure (IBP) circuit.	Separate the invasive blood pressure (IBP) circuit for use, if necessary.
6. Prepare the nitric oxide (NO) circuit, if necessary.	Check availability of the nitric oxide (NO) torpedo and separate the circuit for use, if necessary
9. Connect a multiparametric monitor, 3 standard continuous infusion pumps, 1 continuous syringe infusion pump and 1 continuous blood component infusion pump to the electrical network, as directed.	Separate for use multiparameter monitor, three standard continuous infusion pumps, three continuous syringe infusion pumps installed on the electrical network, as per guidance.
Postoperative phase	
5. Receive patients, observe identification using the identification bracelet and carry out a brief assessment while still in the transport incubator/heated crib.	Receive patients [...] still in the heated crib.
19. Change medications, one at a time, in a continuous infusion pump from the OR to those in the NICU, taking care not to interrupt the flow of medication.	Change medications, if necessary, one at a time, in a continuous infusion pump from the OR to those in the neonatal ICU, with the help of nurses.
20. Assist in multiparametric monitoring, connecting 2 monitors to patients (pre-cordial and post-cordial) to assess O ₂ saturation.	Assist in multiparametric monitoring, connecting patients to two pulse oximeters (precordial position: right hand and postcordial: feet) to assess oxygen saturation, in cases of cyanotic heart disease.
22. Change position following medical instructions.	Relieve pressure points, following medical advice.

C – clarity; R – relevance; P – pertinence; S – scope; O₂ - oxygen; OR - operating room; NICU – Neonatal Intensive Care Unit.

In the preoperative phase, the suggestion made regarding strict control of hemoglycotest (HGT) in identifying hypo/hyperglycemia, instead of clinical signs, stands out. Other suggestions addressed structural/organizational issues such as use of a heated crib at an appropriate voltage instead of a transport incubator and the availability of two bed frames for patients, in order to accommodate all the necessary equipment. Intraoperatively, the changed items were related to the availability and quantity

of equipment relevant to postoperative planning. Figure 1 shows the final version of the checklist.

Discussion

The proposed checklist proved to be valid, through content validity, for neonatal perioperative care. Its construction encompassed the three perioperative phases. It is noteworthy that, when assisting patients

NOME: ENFERMEIRO:		RG:	CHECKLIST DE ASSISTÊNCIA PERIOPERATÓRIA NEONATAL DE CIRURGIA CARDÍACA		DATA:	DATA CIRURGIÁ:
ENFERMEIRO		TÉCNICO DE ENFERMAGEM:		TÉC. ENFERMAGEM		
FASE PRÉ-OPERATÓRIA						
1() Checar programação do procedimento cirúrgico com a equipe médica e aguardar o contato do CC para transporte do mesmo.	8() Verificar junto à equipe médica se há necessidade de intubação orotraqueal antes do procedimento cirúrgico	1() Realizar rotina de monitorização multiparamétrica, controle de sinais vitais e demais cuidados conforme rotina da unidade.	8() Posicionar maleta de transporte na parte inferior do berço aquecido.			
2() Esclarecer aos familiares/cuidadores sobre o procedimento que será realizado com o paciente	9() Verificar funcionalidade do berço aquecido, mantendo na rede elétrica e verificar temperatura que estará indicada no painel frontal, sendo ideal de 36,5° a 37°C.	2() Organizar o leito dispondo os equipamentos médicos hospitalares de maneira organizada e de fácil manipulação, preferencialmente em quarto exclusivo, com dupla régua de leito (para instalação de todos equipamentos e gases medicinais).	9() Auxiliar no transporte do paciente para o centro cirúrgico, se necessário.			
3() Programar escala diária com dois técnicos de enfermagem e um enfermeiro, quando possível, para o dia da cirurgia cardíaca	10() Verificar a necessidade de reabastecimento de torpedos de oxigênio para transporte, dando preferência para o torpedos cheio (> ou = 150mmHg).	3() Atentar para nível de água no umidificador, quando necessário suporte de O ₂ , segundo fabricante e posicionamento adequado do cateter/máscara/tubo orotraqueal.				
4() Informar equipe técnica de enfermagem sobre a programação do procedimento cirúrgico para o paciente e identificando na escala o profissional que ficará responsável pela admissão e cuidados pós-cirúrgicos.	11() Preparar berço aquecido com colchão, cueiro, travesseiro, apoio para bombas de infusão, monitor de transporte e ventilador de transporte/ressuscitador manual.	4() Administrar medicações conforme prescrição médica.				
5() Verificar tempo de jejum e realizar o hemoglicoteste (HGT), conforme prescrição médica.	12() Acomodar o paciente em berço aquecido mantendo monitorização multiparamétrica, bombas de infusão contínuas posicionadas com segurança e oferta de oxigênio quando necessário.	5() Realizar coleta de exames laboratoriais pré-cirúrgicos (função renal, hemograma, coagulograma, pesquisa de anticorpos irregulares, tipagem sanguínea).				
6() Supervisionar condutas e procedimentos realizados durante a fase pré-cirúrgica como manutenção de cateter central de inserção periférica ou cateter umbilical, administração de medicações de horário, higiene oral e corporal, verificação de sinais vitais e posicionamento no leito.	13() Transportar o paciente para o centro cirúrgico acompanhado pelo médico e um enfermeiro, minimamente.	6() Manter jejum conforme prescrição médica, observando ocorrência de alteração de glicemia.				
7() Verificar continuamente se há alterações hemodinâmicas no paciente como cianose, taquipneia, arritmia cardíaca, taquicardia, dermatites e anotar no prontuário eletrônico.	14() Passar condições clínicas do paciente para o enfermeiro do centro cirúrgico informando nome do paciente, idade, sinais vitais, padrão respiratório, dispositivos presentes, medicações em bomba de infusão contínua e voltagem do berço aquecido.	7() Auxiliar no preparo do berço aquecido				
FASE INTRAOPERATÓRIA						
1() Checar o funcionamento dos equipamentos médico-hospitalares através de conexão de cabos na rede elétrica e teste de funcionalidade.	4() Separar o circuito de pressão arterial invasiva (PAI) para utilização, se necessário.	1() Separar para uso monitor multiparamétrico, três bombas de infusão contínua padrão, três bombas de infusão contínua de seringa instaladas na rede elétrica, conforme orientação.	2() Montar cabeceira do leito com: fluxômetros de O ₂ e ar comprimido, válvulas redutoras de O ₂ , e ar comprimido, frasco de aspiração com circuito completo e bolsa-válvula-máscara.			
2() Montar o ventilador mecânico de forma asséptica, protegendo a saída do paciente com campo estéril, colocar água no umidificador, realizar teste de funcionamento, ajustar parâmetros conforme orientação médica e identificar com hora e data de montagem.	5() Checar disponibilidade do torpedos de óxido nítrico (NO) e separar o circuito para utilização, se necessário					
3() Checar a cabeceira de leito, que deve conter: fluxômetros de O ₂ e ar comprimido, válvulas redutoras de O ₂ , e ar comprimido, frasco de aspiração com circuito completo e bolsa-válvula-máscara previamente testado e conectado ao fluxômetro.	6() Organizar equipe para recebimento, realizando dimensionamento segundo a necessidade do paciente.					
	7() Receber informações das condições clínicas do paciente pelo enfermeiro do centro cirúrgico informando: quadro atual e medicações utilizadas para organização do ambiente para recebimento e preparação de medicações necessárias.					
FASE PÓS-OPERATÓRIA						
1() Receber o caso pelo enfermeiro do centro cirúrgico, contendo todas as informações referentes ao paciente.	8() Observar curativos e fixação de drenos e sondas, realizando as trocas seguindo protocolos institucionais.	1() Realizar anotação dos sinais vitais conforme prescrição médica e horário de chegada do paciente em prontuário eletrônico.	6() Realizar alívio dos pontos de pressão, seguindo orientações médicas.			
2() Informar equipe técnica das condições do paciente e solicitar preparação das medicações para a chegada do mesmo de acordo com a passagem do caso.	9() Observar fixação do marca-passo provisório e caso necessário sua utilização, monitorar o mesmo; deixar cabos protegidos e fixados no tórax.	2() Auxiliar na passagem do paciente para o berço aquecido, atentando-se para drenos e sondas presentes e fixá-los adequadamente, atentar-se para não traicionar na manipulação do paciente.	7() Realizar anotação no prontuário eletrônico descrevendo características observadas no paciente, volume e aspecto dos drenagens contidas nos drenos e sondas e sinais vitais.			
3() Retomar ligação ao Centro Cirúrgico liberando retorno do paciente para o setor de origem.	10() Conectar o paciente à monitorização pressão arterial invasiva e manter nivelado à linha média axilar, mantendo curva adequada no monitor.	3() Realizar troca das medicações, se necessário, uma por vez, em bomba de infusão contínua do Centro Cirúrgico para as da UTI neonatal, com auxílio do enfermeiro.				
4() Receber o paciente, observar identificação do mesmo pela pulseira de identificação e realizar breve avaliação ainda no berço aquecido.	11() Conferir a dosagem das medicações instaladas nas bombas de infusão.	4() Auxiliar na monitorização multiparamétrica, conectando o paciente em dois oxímetros de pulso (posição pré-cordial: mão direita e pós-cordial: pés) para avaliação da saturação de oxigênio, nos casos de cardiopatias cianóticas.				
5() Desacoplar o paciente do ventilador de transporte e conectar ventilador pulmonar mecânico definitivo	12() Iniciar avaliação física do paciente, realizando a ausculta cardíaca, perfusão periférica, tempo de enchimento capilar, pressão arterial, presença de drenos e cateteres, marca-passo e avaliar curativo de ferida operatória.	5() Realizar verificação de sinais vitais de 1/1 hora.				
6() Auxiliar na monitorização multiparamétrica; atentar-se para os sinais de alerta: taquicardia, bradicardia, hipotensão, hipertensão, taquipneia, bradipneia, hipotermia, observar traçado do eletrocardiograma.	13() Realizar evolução no prontuário eletrônico descrevendo características da admissão do paciente.					
7() Posicionar adequadamente sondas e drenos no leito.	14() Manter supervisão contínua.					

Figure 1. Final version of the checklist (Portuguese version)

with congenital heart disease, good assessment and planning are essential for efficient participation in the various stages of the operative course, from pre-medication to transport to the ICU.⁽⁴⁵⁾

In the preoperative phase, judges pointed out the need for rigorous measurement of blood glucose levels through hemoglycotest, which is more appropriate, since signs and symptoms such as sweating and paleness are very faint in newborns, making it difficult to detect early hypo/hyperglycemia. Hypoglycemia can produce non-specific signs and many patients with neonatal hypoglycemia are asymptomatic.⁽⁴⁶⁾ Although the population at risk of hypoglycemia accounts for approximately 30% of all births,⁽⁴⁷⁾ premature babies have the greatest risk of glucose dysregulation, and, for these, improvements in glycemic control may have a greater impact on morbidity and mortality.⁽⁴⁸⁾

The outcomes of cardiac surgery are influenced by many factors, ranging from the operative technique to anatomical variations and severity of the disease. Retrospective research carried out in Boston⁽⁴⁹⁾ with 6,793 patients showed that those who had greater intraoperative injury residue (class 3) had a higher adjusted risk of late mortality or transplantation and late reintervention than patients without residual injury (class 1), both verified by intraoperative echocardiography.

During the intraoperative phase, while patients remains in the OR under the responsibility of a surgical team, in the NICU, equipment must be checked and bed must be organized for patients' return. The unit must minimally comply with what is found in the ordinances for opening NICUs.⁽⁵⁰⁾ Nurses are responsible for managing the testing of medical and hospital equipment on a daily basis, ensuring incident prevention, reducing risks to pa-

tients, maintaining quality of care provision and a safe environment for care.⁽⁵¹⁾

The postoperative period in the NICU begins with patient reception, maintaining hemodynamic stability, and in the first 24 hours nursing care is essential for their evolution. The nursing process must be applied, with special attention to vital signs, fluid balance, loss of diuresis and/or vomiting, drain output strictly, every one hour, until 12 hours from the moment of admission, checking every two hours, or according to medical prescription that will be based on patients' hemodynamic condition, until it is stable.⁽⁵²⁾ Furthermore, in cyanotic congenital heart disease, blood flow is interfered with, impairing oxygen saturation. Thus, in the postoperative period, improvement in oxygenation is desired; however, it is important to continuously check pulse oximetry to verify pre-duct and post-duct oxygenation,⁽⁵³⁾ thus using two monitors, in order to identify possible heart failure.⁽⁵⁴⁾

At this stage, it was pointed out by judges that in postoperative patients after cardiac surgery, no change of position is performed in the first 30 days, only pressure points are relieved, in order to avoid pressure injuries. In descriptive research carried out with 252 nurses, 69% reported using a rolled-up blanket or a small soft object as a pressure redistribution surface, showing that pressure injury prevention practices are different for neonatal patients due to gestational age, size and level of disease.⁽⁵⁵⁾

Finally, as a limitation of this study, the small number of experts stands out, although it is considered adequate according to the methodological framework adopted.

Despite this, this research could contribute substantially to adapting nursing professionals' actions and improving care, with a view to contributing to a better prognosis for patients, through the provision of harm-free nursing care and reduction of complications/deaths linked to the occurrence of adverse events in the perioperative period.

Conclusion

The checklist constructed was organized according to the perioperative period and validated by the

committee of judges in relation to objectives, clarity, relevance, pertinence and scope. Considering the results obtained, it is proven that the checklist for neonatal perioperative care in cardiac surgery is a reliable and valid instrument to be subjected to clinical validity in care practice in ICUs, in order to investigate the effectiveness of the material as a resource instructional and guiding assistance.

Collaborations

Gobo-Oliveira M, Santos MAJC, Carvalho NC, Barboza ALM, Morais JF and Meneguim S collaborated with study design, data analysis and interpretation, writing of the article, critical review of relevant intellectual content and approval of the final version to be published.

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