

NURSING ASSISTANCE IN THE RENAL REPLACEMENT THERAPY PROCESS IN PEDIATRICS <https://doi.org/10.63330/aurumpub.009-008>

Brenda Tanielle Dutra Barros¹, Gisele Silva Carvalho², Lucinéia Freita Veloso³, Marcel Jofran Ramalho Martildes⁴, Pablo Rodrigo Nascimento Lobato⁵, Luciane Patrícia Amaral⁶, Renata Ferreira Gomes de Oliveira⁷, Adriano Gonçalves Furtado⁸, Aila Caroline Pinheiro da Costa⁹, Samaritana Aguiar Nascimento¹⁰, Alinne Christiane Oliveira Leite¹¹, Antônio Diogo Guimarães Monteiro¹², Fabiana Pamela Lima da Oliveira¹³, Paula Danielle Franco Chagas Lima¹⁴, Tainã Pinheiro Rodrigues¹⁵, Josiane de Jesus da Silva Nascimento¹⁶ and Rafaela Medeiros Barbosa da Silva¹⁷

¹ Universidade Federal do Pará – Master's Student
E-mail: brendatanielle.enf@gmail.com

ORCID: <https://orcid.org/0000-0002-3184-050X>

² Faculdade Pan Amazônica - Specialist

ORCID: <https://orcid.org/0009-0000-6739-6167>

³ Universidade da Amazônia - Specialist

ORCID: <https://orcid.org/0009-0006-7481-5992>

⁴ Universidade Federal do Ceará – Specialist

ORCID: <https://orcid.org/0009-0002-1651-7752>

⁵ Universidade Estadual do Pará – Specialist

ORCID: <https://orcid.org/0009-0009-1983-5896>

⁶ Universidade José do Rosário Vellano UNIFENAS – Specialist

ORCID: <https://orcid.org/0009-0006-3202-5992>

⁷ Centro Universitário do Pará – Specialist

ORCID: <https://orcid.org/0000-0003-3762-3669>

⁸ Centro Universitário Metropolitano da Amazônia – Specialist

ORCID: <https://orcid.org/0009-0009-1995-0958>

⁹ Centro Universitário da Amazônia – Specialist

E-mail: ailacarolinep@gmail.com

¹⁰ Centro Universitário da Amazônia – Specialist

ORCID: <https://orcid.org/0009-0009-4309-1137>

¹¹ Centro Universitário UNIFATECIE - Undergraduate Student

ORCID: <https://orcid.org/0009-0006-9066-9825>

¹² Universidade da Amazônia - Undergraduate Student

ORCID: <https://orcid.org/0000-0002-7798-244X>

¹³ Universidade da Amazônia - Undergraduate Student

ORCID: <https://orcid.org/0009-0009-9370-4480>

¹⁴ Estácio - Undergraduate Student

ORCID: <https://orcid.org/0009-0002-3719-5852>

¹⁵ Universidade da Amazônia - Undergraduate Student

E-mail: tainapinheiro.enfa@gmail.com

¹⁶ Centro Universitário da Amazônia – Undergraduate Student

ORCID: <https://orcid.org/0009-0000-5238-0138>

¹⁷ Universidade da Amazônia – Undergraduate Student

ORCID: <https://orcid.org/0009-0006-3608-6346>



ABSTRACT

Introduction: Chronic Kidney Disease is defined as the presence of abnormalities in the structure or function of the kidneys, present for more than three months. Children afflicted with Acute Kidney Disease from a wide variety of conditions can have long-term sequelae that can lead to chronic kidney disease many years later. **Objective:** To describe nursing care in the renal replacement therapy process in pediatrics, evidenced in published scientific studies. **Methodology:** study consists of a systematic literature review article with meta-analysis, carried out in a descriptive manner. Considering the research inclusion criteria, articles were analyzed, limited to publication between the years 2019 and 2023, originally published in Portuguese, the articles included could be clinical trials, cohort studies, historical cohorts and case control studies. The analysis of the results was carried out using Bardin's methodology. The final sample of this review therefore ended with 13 articles. **Results and discussion:** It was observed from the analysis of the studies that nursing is the professional group that most directly participates in the process involving hemodialysis, including acting in resolving possible complications. The nurse is responsible for patient care interventions, as they are in charge of planning and executing care. **Final considerations:** Through this study, we sought to demonstrate nursing care in the renal replacement therapy process in pediatrics, since some of the technical care within the competence of nurses and their team are related to complications that may affect the individual during the hemodialysis procedure, most often resulting from water-electrolyte, acid-base imbalance, hemodynamic instability and acute pain.

Keywords: Assistance; Nursing; Renal replacement therapy; Pediatrics.



INTRODUCTION

Chronic Kidney Disease (CKD) is characterized by the progressive and irreversible damage to the kidney's functional units, resulting in the loss of its function. This loss of the body's ability to maintain homeostasis is due to a decrease in the glomerular filtration rate (GFR), reduced tubular reabsorption capacity, and impaired endocrine functions of the kidneys, leading to the accumulation of harmful substances in the body. CKD is defined as the presence of structural or functional abnormalities of the kidneys persisting for more than three months (Oliveira et al., 2021).

According to Rêgo et al. (2019), chronic kidney diseases have gained global prominence due to their high complexity in development, becoming a major public health issue. The kidneys are responsible for filtering all the blood in the human body, cleansing and eliminating impurities, and maintaining the body's homeostasis.

When affected by such pathology, Renal Replacement Therapies (RRT) such as Peritoneal Dialysis (PD) and Hemodialysis (HD) are adopted before considering kidney transplantation. In some cases, the patient may not undergo any procedure, receiving only palliative care. In this context, dialysis is a process in which the solute composition of solution A is modified by exposing it to a second solution, B, through a semipermeable membrane (Neres et al., 2019).

Peritoneal dialysis is a procedure indicated for the treatment of chronic kidney disease. It involves using the peritoneum to assist in blood purification. For this, a peritoneal catheter must be implanted in the patient's abdomen to allow the dialysis solution to be infused and drained (Mattoo et al., 2021).

During development, children go through stages aimed at gradually achieving autonomy and independence. When affected by chronic kidney disease, their lives undergo physical and psychosocial changes that alter this progressive control over their own bodies. The implementation and adaptation to therapeutic procedures necessary for life maintenance characterize a new lifestyle (Neres et al., 2019).

Children affected by Acute Kidney Disease (AKD), stemming from a wide range of conditions, may experience long-term sequelae that can lead to chronic kidney disease many years later. Diagnosis is often delayed, as initial symptoms may be nonspecific or even absent, facilitating rapid disease progression and increased mortality (Buettcher et al., 2020).

In children up to five years old, chronic kidney disease is considered a congenital organ deformity. Between five and fifteen years of age, it is often attributed to hereditary or genetic factors. Consequently, the organ's malfunction leads to overload, compromising and affecting other organs due to the progressive decline in its function (Souza et al., 2019).

One of the most prominent nephrological diseases in pediatrics is Urinary Tract Infection (UTI). Studies show that there are approximately 1.5 million pediatric outpatient visits annually for UTIs in the United States, and up to 8% of children will experience at least one UTI between the ages of one month



and eleven years. *Escherichia coli* is responsible for 80% to 90% of community-acquired acute pyelonephritis cases (Silva et al., 2020).

Moreover, chronic kidney disease represents a significant condition for the pediatric population. Marked by the loss of nephrotic mass and the inability to maintain metabolic and fluid balance, CKD leads children and adolescents to undergo frequent hospitalizations. It is a disease capable of causing physical, emotional, social, and academic impairments (Souza et al., 2019).

In pediatrics, peritoneal dialysis is more commonly indicated due to the quality of life it offers. However, hemodialysis is recommended in cases of abdominal wall malformation, severe pulmonary disease, frequent or recent abdominal surgeries, or when the peritoneum lacks diffusion or ultrafiltration capacity (Mattoo et al., 2021).

Acute Kidney Injury (AKI) is a clinical syndrome characterized by the abrupt decline in kidney function (within hours or days), resulting in decreased glomerular filtration rate (GFR), retention of urea and other nitrogenous waste products, and disruption of fluid, electrolyte, and acid-base balance (Neres et al., 2019).

AKI can be classified into three types based on etiology: Pre-renal (e.g., congenital heart disease, perinatal asphyxia, necrotizing enterocolitis, shock, hemorrhage, hypoxia, cardiac surgery); Intrinsic, due to acute tubular necrosis (e.g., nephrotoxic drugs, hypoperfusion, asphyxia), vascular causes (e.g., venous or arterial thrombosis, cortical necrosis), pyelonephritis, and hemoglobinuria; Post-renal, involving urethral obstruction (e.g., ureterocele, ureteropelvic junction obstruction, primary vesicoureteral reflux), neurogenic bladder, extrinsic compressive lesions (e.g., sacrococcygeal teratoma, hemocolpos), intrinsic obstructions (e.g., fungal bezoar), and kidney stones (Zúñiga & Rodríguez, 2020).

In the neonatal period, infants with perinatal asphyxia are recognized as a high-risk group for AKI, affecting up to 60% of these patients. Their kidneys are highly sensitive to oxygen deprivation, and following hypoxemia, vasoconstriction occurs mediated by adenosine release and decreased GFR. This effect can be inhibited by adenosine receptor antagonists (e.g., theophylline administered within the first hour of life) (Mattoo et al., 2021).

The main characteristic of a neonate with AKI is oliguria, accompanied by biochemical changes such as elevated blood nitrogenous waste products, metabolic acidosis, and electrolyte disturbances (e.g., potassium metabolism disorders, hyponatremia, hypomagnesemia, hypophosphatemia), as well as hematuria, proteinuria, and increased serum urea and creatinine (Zúñiga & Rodríguez, 2020).

Some technical care responsibilities of nurses and their teams, regardless of the patient's access route, are related to complications that may occur during the hemodialysis procedure, most often resulting from hydroelectrolytic and acid-base imbalances, hemodynamic instability, and acute pain (Maia et al., 2020).



The scarcity of literature on peritoneal dialysis in neonatal intensive care units and the nurse's role throughout the dialysis procedure motivated the choice of this topic. This study aims to contribute to the technical-scientific efficiency of care provided to newborns in this condition.

Thus, the importance of addressing this topic is evident. The objective of this research is to describe nursing care in the renal replacement therapy process in pediatrics, as evidenced in published scientific studies.

METHODOLOGY

This study consists of a systematic literature review article with meta-analysis, conducted in a descriptive manner. For the analysis and selection of articles to be included in the review, the titles were initially evaluated based on a search strategy applied to electronic databases, followed by an assessment of the abstracts of studies that addressed the topic (Mendes et al., 2019).

Articles deemed relevant were read in full to exclude those that were off-topic or did not meet the established inclusion criteria. After selecting the articles, the following information was extracted from each: author, year of publication, number of patients included in the study, follow-up duration, methodology applied, and results (Karina et al., 2019).

The study results were analyzed descriptively. As exclusion criteria, articles involving experimental studies or in vitro testing were excluded, as well as narrative reviews, editorials, letters to the editor, preliminary communications, or case reports. Articles published outside the established time frame or in languages other than English were also excluded.

To conduct this article, a bibliographic search was performed in the PubMed, SciELO, and LILACS databases, using various combinations of terms related to the topic. These terms were connected using the Boolean descriptor AND, and the following descriptors from the Health Sciences Descriptors (DeCS) were used: Care; Nursing; Renal replacement therapy; Pediatrics.

Considering the inclusion criteria, the articles analyzed were limited to those published between 2019 and 2023, originally in Portuguese. The included articles could be clinical trials, cohort studies, historical cohorts, or case-control studies.

These articles were selected for their focus on nursing care in the pediatric renal replacement therapy process. The analysis of results was conducted using Bardin's methodology. Regarding Bardin's methodology, it consists of a set of communication analysis techniques aimed at obtaining, through systematic and objective procedures, indicators that allow the inference of knowledge related to the conditions of production and reception of messages (Urquiza, 2016).

This study respected the copyrights of the authors consulted, using the citation and reference standards of the Brazilian Association of Technical Standards (ABNT).

Thus, the present study posed minimal risks. However, it is important to highlight the potential risks of misinterpreting the material, misrepresenting the results, and plagiarism. The researcher of this study committed to conducting a faithful analysis of the selected texts and to adhering to the standards NBR 10520:20024 and NBR 6023:20025 of the ABNT, as well as Law No. 9.610/98 (Copyright Law – LDA), in order to present reliable results to the scientific community in the health field.

As this research does not involve human subjects or co-participating institutions, submission to an Ethics Committee or approval from institutions and/or individuals was not required.

RESULTS AND DISCUSSION

Initially, 108 articles were retrieved. After reviewing titles and abstracts, 54 articles were excluded, and 42 duplicate entries across databases were eliminated. The final sample for this review consisted of 13 articles.

This review article primarily aimed to identify relevant evidence regarding nursing care in the context of pediatric renal replacement therapy, focusing on study designs, geographic and temporal patterns of scientific publication, and levels of healthcare attention.

Analysis of the studies revealed that nursing practice in peritoneal dialysis therapy requires professionals to possess extensive knowledge of technical and scientific skills. Nurses are directly involved in the care of neonates in intensive care units who are undergoing this treatment, providing individualized, comprehensive, and humanized care. The nurse is responsible for care interventions, leading the planning and execution of patient care (Pinto et al., 2023).

In hospital settings, for example, a nursing technician or nurse is responsible for assembling the hemodialysis machine and monitoring the patient throughout the prescribed treatment. Complications frequently arise during hemodialysis sessions, necessitating the continuous presence of the nurse from start to finish to reduce the occurrence of complications and prevent further harm to the patient (Maia et al., 2020).

According to current legislation, it is the nurse's responsibility in renal replacement therapy to assemble and/or replace the peritoneal dialysis system (bags or burettes) for neonates in neonatal intensive care units. Due to the complexity of the system and the number of connections required for proper flow, a technically and scientifically qualified professional is needed (Mattoo et al., 2021).

However, other members of the care team, often nursing technicians, must be well-trained and capable of interpreting the symptoms presented by the child to determine appropriate actions. This responsibility does not lie solely with the person operating the hemodialysis machine but with the entire team involved in the patient's care (Pinto et al., 2023).



Because pediatric patients have a smaller blood volume than adults, specific resources are used to perform hemodialysis safely. These include age- and weight-appropriate materials and strategies to maintain blood pressure, such as administering saline or albumin as priming solutions (Zúñiga & Rodríguez, 2020).

In newborns and even in children, manual peritoneal dialysis systems are used. These systems must be closed to minimize the risk of infection. Additionally, controlling the volume administered is crucial to reduce the risk of abdominal distension, which, if it occurs, may lead to respiratory restriction or leakage of drainage fluid. According to the same author, peritoneal dialysis solutions for treating acute kidney injury contain dextrose at concentrations sufficient to achieve the desired ultrafiltration target (Pinto et al., 2023).

In accordance with current legislation, the nurse is responsible for assembling and/or replacing the peritoneal dialysis system (bags or burettes) for neonates in neonatal intensive care units. Given the complexity of the system and the number of connections required for proper flow, a technically and scientifically qualified professional is necessary. Preference should be given to techniques with the fewest possible connections, closed systems, and the “flush before fill” technique, which involves flushing the system before infusion to reduce the risk of contamination (Zúñiga & Rodríguez, 2020).

Care generally focuses on pre- and post-dialysis procedures, ensuring all tubes are clamped after being filled with dialysis solution and only opened when therapy begins (Buettcher et al., 2020).

The nurse is also responsible for changing dialysis solutions and must monitor serum electrolyte concentrations, which should be measured every 12 hours during the first 24 hours and daily once parameters stabilize (Talati et al., 2019).

Similarly, fluid balance must be monitored by the nurse during treatment, considering intake and losses, including insensible losses. Because fluid balance in these patients must be rigorously maintained, burettes are recommended as they allow precise measurement of both inflow and outflow and reduce the number of connections, thereby minimizing the risk of contamination through contact (Oliveira et al., 2021).

This imbalance may occur in pediatric patients undergoing peritoneal dialysis due to dysregulation of the mechanisms between colloid osmotic and hydrostatic pressures within the peritoneal cavity. Nursing interventions may include fluid control, hydroelectrolytic balance, and fluid monitoring through fluid restriction, assessment of edema, and ongoing fluid balance evaluation (Pinto et al., 2023).

Furthermore, nursing staff must be prepared to respond to emergencies, monitor vital signs and parameters, alleviate anxiety and discomfort in critically ill patients, perform asepsis, assess daily weight, monitor skin hydration, observe fluid balance, and monitor serum hydroelectrolytic levels. The



importance of thorough anamnesis and physical examination of these patients is emphasized throughout this study (Trautmann et al., 2020).

Continuous monitoring of vital signs is essential to prevent complications such as hypotension, which may result from excessive blood volume reduction, loss of vasoconstriction, or cardiac factors, and hypertension, which may be caused by fluid overload, renin response to ultrafiltration, or excessive sodium intake, among other factors (Caxias et al., 2021).

To minimize infection risks, nurses must assess the immunological status of pediatric patients, aiming to maintain adequate immunity by identifying imminent risks, properly sanitizing the catheter and surrounding area, and employing technical and behavioral measures such as aseptic techniques during catheter handling (Zúñiga & Rodríguez, 2020).

Children undergoing renal replacement therapy have special health needs due to their technological dependence, requiring more frequent, vigilant, and intensive care. This condition predisposes them to social isolation, suffering, and stress, negatively impacting the well-being of their caregivers (Thomé et al., 2019).

Supporting this perspective, Guedes et al. (2021) states that the need for adaptation to lifestyle changes in hemodialysis patients highlights the use of therapeutic approaches to manage stressors, promote mental health, and utilize soft technologies.

In the context of pediatric nephrology care, nursing plays a fundamental role in addressing the health needs of children, caregivers, and families. Nurses identify needs and available resources, provide professional support in educational, managerial, clinical, and rehabilitative domains, and implement care plans based on the realities experienced by the child and their family (Costa et al., 2020).

Nurses must be attentive and sensitive to the emotional vulnerabilities of patients, such as denial, frustration, and depression. It is the nurse's responsibility to identify these emotional changes and incorporate them into educational strategies that support coping with the disease and promote treatment adherence (Silva et al., 2020).

Establishing a welcoming environment and active listening has facilitated coping with chronic conditions in childhood. Active listening fosters genuine interest in hearing the patient, which is essential in the daily lives of children with chronic illnesses. It strengthens the bond with healthcare professionals, clarifies doubts, and may reduce complications at home (Oliveira et al., 2021).

However, the numerous responsibilities assigned to nurses and their teams in caring for pediatric hemodialysis patients mean that these professionals spend most of their working hours directly with patients, underscoring the importance of nursing in the multidisciplinary care setting (Maia et al., 2020).

Finally, it is important to emphasize that providing children with treatment that ensures quality of life is not a simple task, nor is the development of methods and techniques to support the child and family



in coping with the situation. Therefore, effective communication between the professional, patient, and family is essential to convey the reality of the disease and treatment, offer support, and foster a relationship based on safety and trust (Guedes et al., 2021).

FINAL CONSIDERATIONS

This study sought to demonstrate the role of nursing care in the renal replacement therapy process in pediatrics. It was shown that some of the technical responsibilities of nurses and their teams are related to complications that may affect the individual during the hemodialysis procedure, most often resulting from hydroelectrolytic and acid-base imbalances, hemodynamic instability, and acute pain.

As a member of the multidisciplinary team providing care to children with kidney disease, the nurse plays a fundamental role in coordinating care. This includes possessing communication skills, offering support and education, and advocating for the most vulnerable children and their families, thereby contributing to holistic care.

The nurse is capable of addressing parameters related to these complications through periodic anthropometric assessments, monitoring laboratory tests, and early identification of complications with immediate intervention alongside the healthcare team during dialysis sessions, aiming to minimize risks and ensure safe treatment for the patient.

The nursing care plan for children undergoing hemodialysis treatment must be individualized and tailored to the specific needs of each patient. It is also emphasized that this plan should include the family and encompass comprehensive care, particularly aimed at promoting quality of life and social inclusion for children undergoing renal replacement therapy.

The nurse must demonstrate availability, provide attention, and develop empathy, promoting active listening, comfort, and stability in a potentially stressful and threatening environment. These holistic interventions align with the philosophy of pediatric care.

Such interventions require professionals to possess technical-scientific knowledge and relational competencies, viewing the child in their entirety and considering their experiences and individuality.

Although technical knowledge about the disease and treatments is essential for providing competent and effective care to children undergoing dialysis—given the complexity of the procedures—the physiological aspect is only one part of caregiving. The other dimensions of the child must not be underestimated.

Therefore, communication between the nurse and the patient is crucial to establishing a relationship of trust and safety, making the treatment less traumatic.

Finally, this study highlights the importance of conducting further research on the topic to strengthen and develop public health policies focused on hemodialysis and pediatric care. It also



encourages the pursuit of new knowledge by healthcare professionals, given the limited number of publications on this subject.

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