Nurses' performance in the face of complications during hemodialysis

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ABSTRACT
Introduction: Chronic renal failure, also known as chronic kidney disease, is a clinical condition characterized by the slow loss of kidney function, whose main function is to remove waste and excess water from the body. This whole problem contributes to a decline in the individual's body, with a variety of clinical manifestations that cause damage. Because it is irreversible, treatment occurs as a way of replacing kidney function. Dialysis is usually necessary when kidney function is lost. In general, most patients tolerate hemodialysis well; however, side effects of hemodialysis can occur. Objectives: To highlight the role of nurses in dealing with complications that can occur in individuals with chronic renal failure during hemodialysis sessions; to describe the main complications that can occur during hemodialysis sessions; and to outline the interventions developed by nurses in dealing with complications during hemodialysis. Method: This is a narrative literature review with a qualitative approach. Results: Thirteen articles were selected for in-depth analysis. These studies are shown in the following table with information about them. Discussion: The most commonly associated complications include hypotension, muscle cramps, nausea and vomiting, headache, purities, fever and chills. Many of the complications are associated with hypotension. Rarely, life-threatening complications such as arrhythmias and other cardiovascular complications occur. Conclusion: As well as providing care, nurses in this context help to identify these complications early on, so that they can intervene appropriately and promote health and well-being, even in the face of the limitations imposed by the disease.

Keywords: Chronic Kidney Disease, Nursing Care, Hemodialysis.

1 INTRODUCTION

Hemodialysis is a process that consists of removing fluids of uremic breakdown products from the body when the kidneys are unable to do them. That is, it is a treatment for severe kidney failure (also called kidney failure or end-stage renal disease). When the kidneys are no longer functioning effectively, waste products and fluids build up in the blood. Dialysis takes over a part of the function of the impaired kidneys to remove fluid and waste (NICOLE; TRONCHIN, 2023).

Chronic Renal Failure (CRF) refers to a syndromic diagnosis of progressive and usually irreversible loss of clearance renal function, i.e., glomerular filtration. It is considered a disease with no prospect of rapid improvement, with progressive evolution, causing medical, social, and economic problems (REIS et al., 2020). Due to its irreversible nature, the vast majority of patients progress to more advanced stages, in which the use of kidney replacement therapy, dialysis, or kidney transplantation is necessary (VERONESE et al., 2019).

It is a serious condition that affects about 10% of the global population and affects people of all ethnicities and age groups. Receiving the diagnosis implies rethinking the entire lifestyle and forces the

person to go through a process of coping with a psychosocial disorder, which requires a psychic and emotional reorganization (MARINHO et al., 2017).

The causes of CKD vary globally, and the most common primary diseases that cause CKD and, ultimately, end-stage renal disease are: type 2 diabetes mellitus; diabetes mellitus type; hypertension; primary glomerulonephritis; chronic interstitial tubule nephritis; hereditary or cystic diseases; glomerulonephritis or secondary vasculitis; plasma cell dyscrasias or neoplasms; sickle cell nephropathy, which accounts for less than 1% of patients with end-stage renal failure. This condition can result from pathological processes in any of three categories: pre-real (decreased renal perfusion pressure), intrinsic renal (pathology of the vessels, glomeruli, or tubule-interstitium), or postrenal (obstructive) (YO et al., 2016).

To identify patients with CKD, according to the Ministry of Health, the diagnostic resources used are the Glomerular Filtration Rate, the summary urine test, and an imaging test, preferably ultrasonography of the kidneys and urinary tract (SANTOS et al., 2017). Early diagnosis and prompt referral to the nephrologist are essential steps in the management of these patients, as they enable pre-dialysis education and the implementation of preventive measures that delay or even interrupt the progression to the more advanced stages of CKD (VERONESE et al., 2019).

Regarding the treatment to replace renal function, it can be conservative, or include dialysis methods (peritoneal dialysis and hemodialysis) and kidney transplantation. Each one has its peculiarities and its choice is made at the discretion of the physician (nephrologist) or, when possible, at the patient's option (YO et al., 2016).

According to Shalhub et al (2017), CKD is a disease as old as humanity itself. In early Rome and later in the Middle Ages, treatments for uremia included the use of hot baths, sweat therapies, bloodletting, and enemas. Current procedures for treating kidney failure include physical processes such as osmosis and diffusion, which are pervasive in nature and aid in the transport of water and dissolved substances.

The first scientific descriptions of these procedures date back to the 19th century and came from Scottish chemist Thomas Graham, who became known as the "Father of Dialysis." In the beginning, osmosis and dialysis became popular as methods used in chemical laboratories that allowed the separation of dissolved substances or the removal of water from solutions through semipermeable membranes. Far ahead of his time, Graham indicated in his work the potential uses of these procedures in medicine. Currently, hemodialysis is described as an extracorporeal procedure, or procedure outside the body, to filter uremic substances from the blood of patients suffering from kidney disease (SHALHUB et al., 2017).

The first historical description of this type of procedure according to Ross et al (2012) was published in 1913. Abel, Rowntree, and Turner "dialyzed" anesthetized animals by directing their blood out of the body and through tubes of semipermeable membranes made of collodion, a cellulose-based material.

However, the first successful dialysis treatment took place in the autumn of 1945, by Willem Kolff of the Netherlands, who made the discovery that doggedly eluded Haas. Scientist Kolff used a rotating drum kidney he developed to perform a week-long dialysis treatment on a 67-year-old patient who had been admitted to the hospital with acute kidney failure. The patient was later discharged with normal renal function.

In addition, dialysis is usually required when approximately 90% or more of kidney function is lost. Kidney function can be lost quickly (acute kidney injury) or over months or years (chronic kidney disease). Early in the course of kidney disease, other treatments are used to help preserve kidney function and delay the need for replacement therapy (NICOLE; TRONCHIN, 2023).

As the clinical use of hemodialysis has become increasingly widespread, Ross et al (2012) evidence that scientists have been better able to investigate the unique attributes of patients with chronic kidney disease. In contrast to the first years of dialysis presented here, the lack of adequate treatment methods or technologies is no longer a challenge in the treatment of renal patients. Today's challenges stem from the large number of patients requiring dialysis treatment, complications resulting from years of dialysis treatment, and a patient population that presents demographic and medical challenges.

In general, most patients tolerate hemodialysis well. However, hemodialysis side effects may occur, among the most common are fever and chills, itching, low back pain, chest pain, headache, nausea and vomiting, cramps and hypotension. Although there are treatments and preventive measures available for discomfort that may occur during dialysis, immediate intervention is necessary during the episode (SANTOS et al., 2023).

Nurses are professionals who are inserted in different moments of care, and their performance is essential for the reestablishment of health. In the case of CKD, and in view of the limitations, the actions are developed with the objective of providing quality of life and permeate the orientation and education for living with the clinical condition and the need for treatment. Given this possibility, nursing plays an important role in the follow-up of these patients, being able to minimize the impacts of these complications, as well as sharing information, guidance, clarification of doubts, among other aspects that result in holistic and personalized care (REIS et al., 2020).

Therefore, it is necessary for nurses to be attentive to the unique characteristics of each hemodialysis patient, taking into account the etiology of kidney disease, knowledge about pathologies, adherence and treatment time, and self-care, in order to be more sensitive to complications and have a better basis for action.

In view of the above, the research aims to answer the following question: What are the actions of nurses in the face of complications during hemodialysis? The study is justified by the recognition that this theme is extremely important within the field of Nephrology, as well as by the fact that it works in a unit

directed to the performance of this procedure, and, in view of this experience, the interest arose in deepening the 6 complications that can be presented by patients during hemodialysis sessions.

2 OBJECTIVES

2.1 GENERAL OBJECTIVE

To highlight the role of nurses in the face of complications that may occur in individuals with chronic renal failure during hemodialysis sessions.

2.2 SPECIFIC OBJECTIVES

- Describe the main complications that may occur during hemodialysis sessions.
- To delimit the interventions developed by the nurse in the face of complications during hemodialysis.

3 METHODS

3.1 TYPE OF SEARCH

This is a narrative literature review study with a qualitative approach.

3.2 LOCATION OF THE BIBLIOGRAPHIC SEARCH

The survey of publications was carried out in the Virtual Health Library (VHL) in the Latin American and Caribbean Health Sciences (LILACS) and Nursing Database (BDENF) databases.

3.3 DESCRIPTORS AND PERIOD OF THE LITERATURE SEARCH

The descriptors used were: Chronic Kidney Disease; Nursing Care; Hemodialysis; Role of the Nurse. The bibliographic search period comprised between March and September 2023.

3.4 CRITERIA FOR INCLUSION AND EXCLUSION OF SCIENTIFIC PAPERS

For the inclusion criteria, we considered books, dissertations, theses, protocols and original scientific articles, available in full, in Portuguese and English, free of charge, published in the last 10 years, and that have a direct connotation with the theme and meet the proposed objectives. Abstracts, duplicate research, and materials that did not meet the proposed plan were excluded.

3.5 PROCEDURES FOR THE SELECTION OF SCIENTIFIC PAPERS

For the selection of the articles, they were submitted and determined based on the inclusion and exclusion criteria, and then an analytical reading of the title and abstract was performed to organize the

information contained and identify the object of study. The selected articles were read in full, in order to extract the content related to the proposed theme.

3.6 PROCEDURES FOR THE ANALYSIS OF SCIENTIFIC PAPERS

The data were analyzed based on the research objectives, in order to interpret the results contained in this material, without personal interference in the information of each author. To this end, a qualitative and comparative approach was made between the selected articles, identifying possible convergences and divergences.

4 RESULTS

A total of 13 articles were then separated for analytical and in-depth reading, composing the results for discussion. The selected studies will be shown in the following table containing information about them.

Chart 1: Description of the studies included in the integrative review according to authors and year of publication, objective, method, outcome, and journal.

Author/Year	Objective	Method	Denouement	Magazine
Corgozinho et al., 2022.	To assess the knowledge of patients with end-stage renal disease regarding risk factors and associated complications before and after an educational intervention.	Randomized intervention study with 101 participants subdivided into two groups from a hemodialysis sector between 2019 and July 2020.	Increased knowledge about the hemodialysis process has led to an understanding of the cause of complications associated with treatment. The educational action was effective and generated positive evaluation indicators.	Rev. enferm. Cent.-Oeste Min.
Souza et al., 2022.	To report nursing care in patients with central venous catheter obstruction for hemodialysis.	This is a descriptive study of the experience report type, developed during the participation in a university extension project in nephrology services.	Nurses' care practice is essential for the development of care aimed at hemodialysis patient safety, specifically in evaluation, maintenance and prevention.	Rev. Enferm. Current In Dermis
Guedez et al., 2021	Identify the nursing care provided to hemodialysis patients	Qualitative and descriptive study	Nursing plays a central role in the development of care directed to hemodialysis patients, as they propose physical and biopsychosocial interventions that adapt to the needs of patients, seeking to improve or maintain the quality of life of these people	R. pesq.: cuid. fundam. online
Alves et al., 2021	To detect the main intradialytic complications in	This is an observational, longitudinal-	The nursing team is primarily responsible for the care dynamics that	Braz. J. Hea. Rev

	patients with chronic kidney disease with comorbidities, as well as the main nursing actions to prevent and reverse these events.	prospective, quantitative, descriptive and analytical study carried out in the hemodialysis sector of a public hospital in western Pará.	must be provided to the patient during this process, so it is up to these professionals to remain equipped with technical and scientific knowledge.	
Maia et al., 2021	To evaluate the nursing care provided to chronic renal patients on hemodialysis during the handling of the Double Lumen Catheter.	This is a descriptive, cross-sectional study conducted in a hemodialysis clinic in a medium-sized city in northeastern Brazil.	The study showed that there are gaps in nursing care for patients using catheters, and that nurses need constant guidance and supervision of the team to avoid them.	R. pesq.: cuid. fundam. online
Santos et al., 2021	To describe the nurses' interventions in clinical complications during outpatient hemodialysis, as well as to describe the main complications during outpatient hemodialysis sessions and	This is a qualitative descriptive study	The nurse's work involves the rapid detection of possible complications during hemodialysis treatment and agility to intervene in order to ensure the effectiveness of this procedure and better health status of the client	Rev. Essays & Science
Siqueira et al., 2021	To identify the main complications and nursing care related to hemodialysis in patients with Chronic Renal Failure.	Qualitative and descriptive study	It is essential for the nursing team to be trained to know how to recognize early the complications that may occur during and after hemodialysis, in addition to performing the necessary interventions, in order to provide quality care.	Rev Bras Interdiscip Saúde
Marinho et al., 2021	To know the routine of nurses in the hemodialysis sector of a public hospital in the Northeast of Brazil.	Field study of exploratory and descriptive nature, qualitative approach. Developed in the hemodialysis sector of a public hospital located in Campina Grande, Paraíba	The multiplicity of attributions and activities in the routine of nurses in the hemodialysis sector was evident in the study, which showed the essential role and protagonism of nurses within such a specific and highly complex sector.	Sick. in Focus
Almeida et al., 2021	To describe and analyze the nursing interventions prescribed for the prevention and management of complications during hemodialysis.	Qualitative and descriptive research	Nurses play a fundamental role in the development of interventions for the prevention and management of complications during hemodialysis.	Research, Soc. and Development.

Gonçalves et al., 2020	Identify the main nursing care directed to hemodialysis patients	Descriptive and exploratory study	The nurse's work should be directed to minimize the chances of these potential complications, through daily clinical evaluation and monitoring of vital signs during the hemodialysis session	Braz. J. Hea. Rev
Gomes; Nascimento, 2018	Identify nursing complications and interventions during hemodialysis sessions	This is a descriptive study with a quantitative approach, carried out in a hemodialysis service	Continuing education of the nursing team is recommended for the clinical and physiological understanding of intercurrences, early recognition of signs and symptoms involved, and actions validated by the literature for the correction or minimization of complications.	Enferm Brazil
Lima et al., 2018	OBJECTIVE: To describe the main complications found during hemodialysis treatment in patients with renal failure in a Nephrology Unit of a public referral hospital in the city of Porto Velho, Rondônia	This is an exploratory-descriptive, retrospective, quantitative study	The nursing team is very important in the continuous observation of patients during the hemodialysis session, saving many lives and avoiding many complications by making an early diagnosis and acting on resolution.	Rev Bras Interdiscip Saúde
Silva et al., 2018	OBJECTIVE: To identify complications presented during hemodialysis sessions in intensive care patients in the Federal District.	This is a descriptive, quantitative study conducted in a public hospital in Brasília, between June and August 2015.	The main complications presented were hypotension, arrhythmias followed by hypoglycemia, hypothermia and problems in the extracorporeal circuit, which require the nurse to have the ability and knowledge to recognize them early.	Rev. enferm. Cent.-Oeste Min

5 DISCUSSION

It is considered that hemodialysis, because it consists of an invasive and complex intervention, individuals who are submitted to this method become more susceptible to the problems resulting from the sessions.

According to Alves et al (2021), the complications that have a higher incidence during the hemodialysis session are hypertension and hypotension. These problems occur due to hemodynamic instability and due to excessive fluid removal by dialysis and improper fluid replacement.

In addition to these main complications, Marinho et al (2021) and Gonçalves et al (2020) report that during the hemodialysis consultation, other impairments such as diarrhea, abdominal pain, dyspnea, hypersensitivity reaction, pruritus, low back and chest pain, convulsion, headache, vomiting and nausea, muscle cramps, and hypoglycemia also occur.

According to Corgozinho et al (2022), occasionally, preventable serious diseases occur, such as pyrogenic reaction, reaction to chemical residues, hemolysis, and gas embolism, which, when identified early, can be regulated without triggering impactful harm to the patient. In addition, hemolysis can be caused by "lysis" in blood cells, which results in the release of hemoglobin and a decrease in the number of red blood cells.

It is estimated that complications during hemodialysis occur in 30% of sessions and, as a result of changes in the fluid and electrolyte balance, contribute to the patient's safety and protection being affected (SILVA et al., 2018).

According to Guedez et al (2021) and Lima et al (2018), among the most dangerous and even fatal intradialytic impairments are cardiorespiratory arrest, gas embolism, cardiac arrhythmia, and intracranial hemorrhage. These problems can occur as a result of hemodynamic imbalance syndrome. In addition to these complications, external events may also occur, such as problems such as coagulation of the extracorporeal system (resulting from insufficient or incorrect administration of saline solution or anticoagulant in the system) and venous access (low flow in the fistula, catheter obstruction, among others). However, death is defined as a complication between hemodialysis sessions, which is the most serious of all, resulting from any of the complications mentioned so far.

In addition, in general, the complications that present a lower incidence in hemodialysis sessions include pain in the lower limbs, gastrointestinal hemorrhage and hypothermia (GOMES; NASCIMENTO, 2018).

According to Siqueira et al (2021) and Alves et al (2021), in addition to the difficulties inherent to therapy and hemodynamic instability, they still remain exposed to the potential risks of treatment-related adverse events. These events include coagulation of the extracorporeal system, accidental removal of the needle from the fistula, and a blocked catheter. In many cases, this event is related to health professionals (lack of attention, lack of preparation, lack of communication, failures) and to the organizational context (lack of resources, quality of materials, work overload, inadequate physical area, human resources, absence of specific protocols).

For Guedez et al (2021), some complications are related to the contamination of the water used in the therapeutic intervention. In this context, the main occurrences are nausea and vomiting, due to zinc and sulfates, nitrates, magnesium, low pH, bacteria, endotoxins, copper and calcium; hypotension, nitrates, endotoxins, bacteria, and nitrates; metabolic acidosis, sulfate acidosis and low pH; anemia, by zinc and copper, chloramine and aluminum; bone disease, caused by fluoride and aluminum; hemolysis, by chloramines, nitrate and copper; neurological degeneration, by aluminum; death, by fluoride, aluminum, endotoxins, chloramine and bacteria. It is also important to take care of water treatment centers for dialysis, as many complications can be avoided.

In view of the information presented, the nursing intervention deals with any treatment based on clinical knowledge and judgment performed by a professional in the area to promote patient outcomes. Interventions include indirect and direct care, aimed at individuals, family members, and also the community (SIQUEIRA et al., 2021; MAIA et al., 2021).

According to Maia et al (2021), care for patients with chronic kidney disease needs a more humane and attentive look from the health team, especially the nurse, given that injuries during the hemodialysis session can occur due to the inconstancy of vital signs and the impacts of these complications, which sometimes are associated with the care provided.

According to Alves et al (2021), partially simple interventions, such as observing the cycles of the dialysis machine; offering general guidance on treatment; attention to audible signals (indicative of changes in blood flow, temperature, and the presence of bubbles in the circuit); providing psychological and physical support and clarification of doubts, diligent measures were indicated to minimize negative impacts at the time of complications.

According to Souza et al (2022) and Siqueira et al (2021), the necessary interventions in all intradialytic occurrences are assessment of the patient's general condition, continuous observation, monitoring of vital signs, communication of changes to the nephrologist on duty, administration of prescribed medications, guidance on weight maintenance, and recording of the care provided in the medical record.

However, specific nursing interventions for cases of hypoglycemia and hypotension, due to the complications that have a high incidence during hemodialysis sessions, comprise the administration of 50% GS intravenously according to medical prescription (SIQUEIRA et al., 2021).

The interventions listed by Souza et al (2022) and Almeida et al (2021) are necessary in all intradialytic occurrences, namely: assessment of the patient's general condition, monitoring of vital signs, continuous observation of the patient, reporting changes to the nephrologist on duty, administering medications, as prescribed by the doctor, guidance on weight maintenance, recording in the medical record all care provided.

In addition, Corgozinho et al (2022) report that nursing interventions in specific conditions such as hypotension and hypoglycemia, as these are two complications of high incidence during hemodialysis sessions. In these cases, the nursing interventions performed on the patients, who presented hypoglycemia, were the administration of 50% GS intravenously according to medical prescription, alteration of the prescribed ultrafiltration and, for cases of recurrence, the dialysis session should be interrupted. The nurse's performance in the face of this complication, from patient monitoring, detection of abnormalities and rapid intervention, is essential to ensure a safe and efficient procedure.

Other interventions prioritized by the nurses during the episodes of complications were: irrigation of the system with saline solution, positioning of the patient in Trendelemburg, zero losses, alteration of the prescribed ultrafiltration and suspension of the dialysis session, especially in cases of hypotension (NASCIMENTO; GOMES, 2018).

However, infection prevention and control measures are essential activities of hemodialysis nurses, especially for patients with central venous catheters, due to the greater exposure to a high rate of infection if the correct technique is not applied. Thus, it is their role to supervise or develop permanent education activities for the other members of the team with a focus on infection prevention.

6 CONCLUSION

The main clinical complications during outpatient hemodialysis sessions, according to the research, are: hypotension, hypoglycemia, hypertension, nausea and vomiting, cramps, pruritus and hypothermia. Regarding the nurse's interventions, in general, they were: fluid and electrolyte monitoring, verification of vital signs, administration of medications, according to medical prescription and patient guidance.

The mechanism of these complications is multifactorial and the treatment of these complications is important to prevent patient mortality. In addition, prevention is important, including multiple disciplinary approaches. Thus, the nurse's work involves, therefore, the rapid detection of these events during hemodialysis treatment and agility to intervene in order to ensure the effectiveness of this procedure and better health status of the client.

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