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MANAGEMENT OF LIQUID VOLUME AND INTOLERANCE TO ACTIVITY IN THE PERSON UNDERGOING HEMODIALYSIS: CASE REPORT

GESTÃO DE VOLUME DE LÍQUIDOS E DA INTOLERÂNCIA À ATIVIDADE NA PESSOA SUBMETIDA A HEMODIÁLISE: RELATO DE CASO

GESTIÓN DEL VOLUMEN DE LÍQUIDO E INTOLERANCIA A LA ACTIVIDAD EN LA PERSONA SOMETIDA A HEMODIÁLISIS: REPORTE DE CASO

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ABSTRACT

Objective: To elaborate a proposal for a Nursing Care plan by focusing on excessive fluid volume and activity intolerance in the person with chronic kidney disease undergoing hemodialysis.

Methods: Case study of a 71-year-old male patient with insulin-treated diabetes on hemodialysis for about four years. The Marjory Gordon's Functional Health Patterns Theoretical Model was used for data collection and NANDA-I, NIC and NOC taxonomy for the realization of the Nursing Care plan.

Results: Based on the initial assessment, 14 nursing diagnoses were identified, from them two ones stood out as being the priority ones: excessive fluid volume (00026) and activity intolerance (00092).

Conclusion: Adequate fluid management and the implementation of an exercise program minimize activity intolerance and contribute to improving quality of life.

Keywords: Activities of Daily Life; Chronic Renal Disease; Hemodialysis; Liquid Intake; Nursing care.

RESUMO

Objetivo: Elaborar uma proposta de plano de Cuidados de Enfermagem com enfoque no volume de líquidos excessivo e intolerância à atividade na pessoa com doença renal crónica em hemodiálise.

Métodos: Estudo de caso referente a um utente do sexo masculino, 71 anos, com diabetes insulino-tratada, em hemodiálise há cerca de quatro anos. Foi utilizado o Modelo Teórico Padrões Funcionais de Saúde de Marjory Gordon para colheita de dados e taxonomia NANDA-I, NIC e NOC para a realização do plano de Cuidados de Enfermagem.

Resultados: Com base na apreciação inicial identificaram-se 14 diagnósticos de enfermagem, dos quais se destacaram dois, como sendo os prioritários: Volume de líquidos excessivo (00026) e Intolerância à atividade (00092).

Conclusão: Uma gestão de líquidos adequada e a implementação de um programa de exercício minimiza a intolerância à atividade e contribui para a melhoria da qualidade de vida.

Palavras-chave: Atividades Cotidianas; Cuidados de Enfermagem; Doença Renal Crónica; Hemodiálise; Ingestão de Líquidos.

RESUMEN

Objetivo: Desarrollar una propuesta de plan de Atención de Enfermería centrado en el volumen excesivo de líquidos y la intolerancia a la actividad en personas con enfermedad renal crónica en hemodiálisis.

Métodos: Estudio de caso de un paciente masculino de 71 años con diabetes tratada con insulina en hemodiálisis durante aproximadamente cuatro años. Se utilizó el Modelo Teórico de Estándares Funcionales de Salud de Marjory Gordon para la recolección de datos y la taxonomía NANDA-I, NIC y NOC para la realización del plan de Atención de Enfermería.

Resultados: A partir de la evaluación inicial se identificaron 14 diagnósticos de enfermería, de los cuales dos se destacaron, como prioritarios: volumen excesivo de líquidos (00026) e intolerancia a la actividad (00092).

Conclusión: El manejo adecuado de los líquidos y la implementación de un programa de ejercicio minimizan la intolerancia a la actividad y contribuye a mejorar la calidad de vida.

Descriptores: Actividades Cotidianas; Atención de Enfermería; Enfermedad Renal Crónica; Hemodiálisis; Ingestión de Líquidos.

INTRODUCTION

The World Health Organization (WHO) report states that the main chronic diseases are cardiovascular, chronic respiratory diseases, cancer, and diabetes, with devastating consequences for individuals, families and communities, in addition to overburdening health systems[1].

Chronic kidney disease (CKD) is characterized by the slow, progressive and irreversible destruction of kidney function, which forces the person to undergo renal replacement therapies, such as hemodialysis (HD), peritoneal dialysis or transplantation[2].

CKD causes drastic changes in the individual's daily life activities, physically, mentally, socially and in the quality of life. Health-related quality of life is the optimum level of physical, mental, social and performance, including relationships, health perceptions, good physical condition, satisfaction with life and well-being[3].

HD is generally performed three times a week, lasting three to four hours per session, which leads to a routine of many restrictions and limits activities of daily life[4]. This routine favors the reduction of functional capacity (FC) and levels of physical activity (LPA), which in turn increases the risk of mortality[5].

Individuals on pre-dialysis or who are already undergoing hemodialysis have reduced functional capacity and quality of life[4]. Other studies show that dialysis treatment interferes with functional capacity (FC) regardless of the stage of CKD and the time of onset of hemodialysis, and that dialysis can compromise the time available for physical activities and meals, thus increasing physical and depressive symptoms and decreasing functional capacity[4].

People with CKD have changes in physical function due to the disease; however, after starting hemodialysis, they may present sarcopenia and other changes resulting from treatment, including fatigue, cramps, prostration, anemia and depression, being limiting to the practice of physical activity[5]. Furthermore, the lack of physical exercise may cause musculoskeletal changes, such as fatigue and decreased resistance. Psychological disorders, especially depression, resulting from kidney disease and inactivity are important factors that negatively influence physical function[5].

Therefore, it is important to identify the characteristics of these people, as it helps in achieving better clinical approaches, in the intervention in emotional and physical aspects in order to increase the quality of life[4].

Physical activity has been progressively implemented in this population as a therapeutic intervention, and the literature identifies that a combination of aerobic exercise and resistance exercises brings better results[6].

The beneficial effects of exercise described and observed in several studies were found in terms of the cardiovascular system, bone mineral metabolism, physical capacity, quality of life as well as psychological benefits, and in the elimination of solutes during hemodialysis[7].

In some studies it was found that the practice of controlled physical exercise, after the construction of the arteriovenous fistula (AVF), favors its maturation, increasing the muscle mass and the diameter of the vessel and decreasing the adipose tissue[8].

It was also found that people submitted to HD, who have nutritional problems, such as loss of muscle mass, weakness, and cachexia, were associated with poor clinical results. The presence of sarcopenia is very common, and it is associated with loss of muscle mass and muscle weakness[9]. Another factor that influences the decrease in muscle mass is the high concentration of sclerostin (Scl) (osteoblast-inhibiting glycoprotein) and decreased physical function[10].

Performing resistance exercises increases strength and muscle function and improves the metabolic profile. These exercises can also decrease arterial stiffness and pulse pressure and increase the strength of the arterial wall[11].

However, to benefit from these positive effects of exercise, the safety of interdialytic training in this population must be related to the adequacy of the dialysis efficiency measurement (Kt/V)>1, hemoglobin >10 g/dL, interdialytic weight gain <2.5 kg and pre-dialysis potassium <5.5 mmol/L. Adequate control of the presence of cardiovascular signs should also be considered, such as dyspnea, dizziness, chest pain and vital signs[11].

For an interdialytic weight <2.5 kg it is important that the person adopts self-care measures used in water restriction, since the kidney no longer has its capacity for ultrafiltration and excretion of waste and toxins, with the body having a tendency to accumulate, manifested by weight gain and high levels of pre-dialysis potassium and phosphorus[12].

In view of the above, this study aims to develop a proposal for a Nursing Care plan with a focus on excessive fluid volume and activity intolerance in the person with chronic kidney disease on hemodialysis.

METHODS

This case study follows the guidelines of CAse REport (CARE)[13]. This case study was developed in the context of clinical teaching. The information was collected through user interviews, observation, and physical examination and also by consulting clinical data in the computer program used at the Clinic. The user was informed about the purpose of the study and his rights, guaranteeing the anonymity, privacy and confidentiality of all data and obtaining free and informed consent, in accordance with the ethical principles provided for in the Declaration of Helsinki and the Oviedo Convention. The participant was selected non-randomly. The inclusion criteria were: being over 18, having been on a dialysis program for more than a year and having accepted to participate in the study freely. The user was followed for 5 weeks. The data collection and analysis was validated by the clinical education advisor.

The case report is outlined in Fig. 1 following the model developed by CARE[13]. It is a case study referring to a 71-year-old Caucasian man, married, with fourth grade, retired, with insulin-dependent diabetes, on hemodialysis for about four years.

For the initial assessment, the theoretical framework of Functional Health Standards (FHS) by Marjory Gordon was used. After analyzing the collected clinical data, nursing diagnoses (ND) were formulated using the Taxonomy North American Nursing Diagnosis Association – International – NANDA-I[14], intervention planning was carried out according to the Nursing Interventions Classification – NIC[15] and the initial evaluation of results and their indicators was elaborated according to Nursing Outcomes Classification – NOC[16].

The user's hydration status was obtained through BCOM by electrical bioimpedance, by analyzing the parameters of absolute hyperhydration (AWOH= Average pre-dialysis weight – Normohydrated weight, which is obtained by BCM, and relative hyperhydration (AvROH= OH (hyperhydration)/ECW (extracellular water)%).

Figure 1 – Initial assessment according to PFS flowchart.

RESULTS

Initial assessment

From the data analysis (figure 2), two dysfunctional health patterns were identified: 2. Nutritional and Metabolic and 4. Activity-exercise with the main need for intervention, resulting in the formulation of two priority NDs: 2. Excessive fluid volume (00026) and 4. Activity intolerance (00092), respectively (table 1). They resulted from the interpretation of significant changes in interdialytic weight gain, absolute (AWOH) and relative (AvROH) fluid overload, shown in table 2, and symptoms such as dyspnea and fatigue when performing the desired daily activities.

Pattern 1: Health Perception And Control
He understands the etiology of the situation. In addition to nephrology it is followed by cardiology and diabetology consultation. Ex-smoker at 45 years-old.

Pattern 2: Nutritional And Metabolic
Denies changes in intake factors.
Dry weight-70.5 kg and normohydrate weight 70.4 kg (5/20/20)
Measures 1,66 m
BMI= 26.6 kg/m^2 (20/05/20) – pre-obesity.
Blood glucose control 3 times a day.
19/06/2020 – 1st day of hemodialysis 215 mg/dL. 4th H of hemodialysis 168 mg/dL.

Pattern 3: Elimination
Residual diuresis, unaccounted and regular bowel habits with a dejection per day.

Pattern 4: Activity – exercise
Independent in life activities according to the Barthel index-100 points. He does not exercise, but works on various construction projects and has a vegetable garden, saying it is difficult to maintain due to fatigue. Cardio-defibrillator implanted in 2009.

Pattern 5: Sleep – Rest
Oxygen therapy during the night, 6 hours at 2 L. Insomnia (difficulty in maintaining sleep and dissatisfaction with sleep). Medicated with mirtazapine and lorazepam.

Pattern 6: Cognitive – Perceptive
4th grade, he can write and read. Conscious, oriented and presents no difficulties in understanding. He wears glasses. There is a decrease in bilateral auditory acuity.

Pattern 7: Self-perception – Self-concept
He shows availability and pleasure for dialogue. He blames himself for not having chosen a transplant when he had criteria for doing so.

Pattern 8: Paper – Relationship
He lives with his retired wife who gives him support and attention. He has the family support of his only son.

Pattern 9: Sexuality – Reproduction
He is married and has a son who supports him and two grandchildren.

Pattern 10: Adaptation – Tolerance to Stress
He sees hemodialysis as something that helps to keep him alive and that everyone in the clinic is like a second family.

Pattern 11: Value – Belief
Catholic, but he is not a practitioner. He refers to living life as much as possible and doing what is necessary.

Figure 2 – Evaluation according to Marjory Gordon's Functional Health Patterns.

Nursing care plan

The planned interventions were mainly in the area of education on the therapeutic regime, specifically water restriction and lifestyle (Teaching: Prescribed Activity/Exercise).

Table 1 – Care plan according to taxonomy NANDA-I, NIC, NOC.

1. Excessive liquid volume (00026) which is characterized by weight gain in a short period related to excessive fluid intake and compromised regulation mechanism.[14].

Results (NOC)[16]	Indicators[16]	Initial score
0504 – Renal function	050402 – Balance between intake and elimination in 24 hours.	2 (scale ranges from 1 – severely committed to 5 – not committed)
	050418 – Weight gain.	3
0601 – Water Balance	060101 – Blood pressure.	3
	060119 – Hematocrit.	3
	060109 – Stable body weight.	2
	060112 – Peripheral edema.	5 (scale ranges from 1 – severely committed to 5 – not committed)
Interventions[15]		
2100 – Hemodialysis therapy		
• To record vital signs and weight pre and post dialysis. • To monitor blood pressure during dialysis. • To work with the patient to adjust the diet, fluid and medication limitations that regulate water and electrolytic exchanges between treatments.		
4120 – Water control		
• To keep accurate record of intake and elimination. • To monitor laboratory results relevant to fluid retention. • To monitor the patient's weight changes before and after dialysis. • To monitor for signs of fluid overload / retention (edema), as appropriate.		
1260 – Weight control		
• To develop with the individual a method of keeping a daily record of intake, exercise sessions and/or changes in body weight. • To determine individual motivation to change eating habits.		

Table 1 – Care plan according to taxonomy NANDA-I, NIC, NOC.

2. Activity intolerance (00092).		
Results (NOC)[16]	Indicators[16]	Inicial score
0007 – Level of fatigue	000715 – Daily life activities.	5
	000718 – Performance in the way of life.	3
	000721 – Balance between activity and rest.	3
	000723 – Hematocrits.	4 (scale ranges from 1 – severely committed to 5 – not committed)
0005 – Tolerance to activity	000518 – Ease of carrying out activities of daily living.	4
0414 – Cardiopulmonary status	041401 – Systolic blood pressure.	5
	041402 – Diastolic blood pressure.	5
	041424 – Dyspnea at rest.	5
	041425 – Dyspnea with mild exertion.	3
	041426 – Fatigue.	3 (scale ranges from 1 – severely committed to 5 – not committed)
Interventions[15]		
5612 – Teaching: Prescribed Activity/Exercise		
• To assess the patient's current level of exercise and knowledge about the prescribed exercise.		
• To monitor the patient for physiological and psychological limitations, as well as in relation to culture.		
• To inform the patient about the purpose and benefits of the prescribed exercise.		
• To guide the patient on how to perform the exercise.		
• To guide the patient on how to monitor exercise tolerance.		
4040 – Cardiac care		
• To make sure the activity level does not compromise cardiac output or cause cardiac events.		
• To combine exercise with rest periods to avoid fatigue.		
• To monitor the patient's tolerance to activity.		
• To monitor the appearance of dyspnea, fatigue, tachypnea and orthopnea.		
• To advise the patient on the importance of immediately reporting any chest discomfort.		

Clinical findings - Hydration status

Depending on the assessment of the hydration status by BCM, it was concluded, through the parameters AWOH and AvROH, which the user was in a state of hyper hydration.

Regarding the absolute water overload, the user is in a severely hydrated state (>2.5 L) between the months of February and May, corresponding to a relative water overload >15%.

Table 2 – Absolute (AWOH) and relative (ROH) hyper hydration.

Month	Values BCM
February	ROH: 20,9
	AWOH: 3.8
March	ROH: 21
	AWOH: 3.8
April	ROH: 21,1
	AWOH; 3.7
May	ROH: 18,5
	AWOH: 3.3

DISCUSSION

The person with chronic renal failure (CRF) has profound personal changes that have repercussions on the family, appearing mostly associated with social, economic problems and large health expenditures[17]. In addition to CRF, HD, uremic syndrome and uremic neuromyopathy cause loss of muscle strength, deconditioning and limitations in functional capacity[18]. In general, HD affects in several aspects namely, physical, psychological, social and environment. In addition, it interferes with the performance of life activities, pain, subjective well-being, happiness, in the sense of humor as well as stress, anxiety and depression[19-23].

In addition to the problems in the musculoskeletal system associated with people on a HD program, the evidence shows that this group also has a higher prevalence of cardiovascular diseases[17].

People on a HD program are faced with a complex therapeutic regimen and many have difficulty managing fluid and diet restrictions, thus increasing the risk of morbidity and mortality[12]. Usually, a person submitted to HD can ingest 500 mL of fluids in addition to his diuresis, and people with anuria have more difficulty in managing thirst[12].

Dietary restriction focuses on moderating consumption of potassium-rich foods to prevent hypercalcemia, which can cause severe arrhythmias and phosphorus restriction in the diet, which aims to prevent hyperparathyroidism and ectopic calcifications[12].

Poor management of fluid restriction can cause high interdialytic weight gain (IWG), resulting in hypervolemia, leading to hypertension, ventricular hypertrophy and increased cardiovascular mortality and morbidity[23,19]. However, IWG may be influenced by nutritional status and may not clearly reflect excess of fluids[12].

A new technique used for the assessment of water overload is the use of the body composition monitor (BCM), which together with the assessment of dry weight, allows better control of liquids and significant improvements in the symptoms of hyper or under-hydration, thus decreasing the risk of cardiovascular comorbidities[24], and consequently, increases the risk of activity intolerance[5,11], due to physical deconditioning[18].

Oxygen consumption (VO_2) is the main parameter to measure aerobic capacity that indicates the amount of O_2 that is used in rest conditions or when exercising. Although anemia is the limiting factor of VO_2, it is important to use an exercise program to improve muscle function. Without it, the increase in hematocrit is ineffective for improving aerobic capacity[18].

The accumulation of uremic toxins, insulin resistance, hyperparathyroidism, protein and amino acid loss and the release of cytokines can cause muscle atrophy and, consequently, loss of strength, leading to physical deconditioning[18].

The practice of aerobic exercise during hemodialysis promotes greater removal of solutes such as urea and phosphorus, thus preventing atrophy and improving muscle strength[17].

A safe method of exercise during HD is the use of stationary bikes that do not cause hemodynamic instability, in which hypotension is the most common, although rare, adverse event. Therefore, it is recommended that the exercise program runs in the first two hours of HD, since, after these two hours, the change of intravascular fluids to the interstitial space leads to a reduction in blood volume and, subsequently, hypotension[8,11,18].

In order to reduce adverse events, appropriate heating and cooling is recommended, starting with lower temperatures that are gradually increased, meeting the objective of ultrafiltration of the treatment and blood pressure values. For this, it is essential to carry out the dry weight assessment more frequently[18].

It was found that the exercise program maintained for at least 3 months, 3 days a week, during the first hour of HD, is a viable way to improve functional capacity[17].

Implications for professional practice and health policies

Since the assessment and monitoring of the IWG, AWOH and AvOH provide an objective assessment of water overload and allow for better liquid management, further investigation must be carried out in relation to these three criteria, with the purpose of being included in NANDA-I.

It is also important for the health professional to pay attention to the importance of implementing exercise programs, and to know the physiological and psychological limitations that vary depending on the person on HD.

Limitations

Due to the short period of five weeks of Clinical Education: Nursing in Hospital Care, due to the current situation of the COVID-19 pandemic, it was not possible to continue the follow-up of the case, having limited the collection and analysis of data and, consequently, the verification of effectiveness interventions.

FINAL THOUGHTS

Understanding the impact that poor water management has on a person's quality of life in HD, although asymptomatic, is reflected in the IWG and in the values of AWOH and AvOH and proves to be important for planning nursing interventions.

The theoretical framework used in this work simplified the development of ND using the NANDA-I, NIC and NOC Taxonomy and the assessment of the patient's hydration status by BCM, facilitated the establishment of priorities in diagnoses and interventions.

Despite the possible 16 ND for care planning, two diagnoses were highlighted: "excessive fluid volume (00026)" and "activity intolerance (00092)".

Although the short period did not allow to evaluate the results of planned interventions, according to studies already carried out, it is considered that adequate control of water management brings significant improvements in the symptoms of hyper or under-hydration and reduces comorbidities and the risk of mortality. The implementation of a low intensity exercise program, in the first two hours of HD, not only improves aerobic capacity, but also muscle function and the elimination of toxins during HD, thus reducing other symptoms such as fatigue.

It is concluded that the response to priority NDs contributed to the resolution of the remaining diagnoses, since they are associated. Thus, the proposed initial objective was achieved, given that strategies were identified that can minimize intolerance to activity and improve quality of life.

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