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Safety of patients with chronic kidney disease in hemodialysis clinics in Northeastern Brazil

Segurança de pacientes com doença renal crônica em clínicas de hemodiálise no Nordeste do Brasil

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ABSTRACT

Objective: Analyze patient safety in hemodialysis clinics in Northeastern Brazil. **Methods:** One hundred eighty-one nursing professionals from 11 hemodialysis clinics in Fortaleza, Brazil, participated. Data collection occurred through the application of a sociodemographic characterization form and the Patient Safety Assessment Scale for Chronic Patients in Hemodialysis. Descriptive analysis of quantitative variables and the Chi-Square and Likelihood Ratio statistical tests were performed. **Results:** The study showed that 165 (91.2%) subjects received safe care practices, while 16 (8.8%) received unsafe care practices, originating from two (18%) hemodialysis clinics. There was a significant association between work hours ($p = 0.017$) and participation in patient safety training ($p = 0.005$) and care practices. **Conclusion:** Non-compliant patient safety practices were identified, associated with sociodemographic factors of the nursing team. Targeted interventions are needed to improve patient safety in these settings.

Keywords: patient safety; hemodialysis units, hospital; nephrology nursing; evaluation study.

RESUMO

Objetivo: analisar a segurança do paciente em clínicas de hemodiálise no Nordeste do Brasil. **Métodos:** participaram 181 profissionais de enfermagem de 11 clínicas de hemodiálise de Fortaleza, Brasil. A coleta de dados ocorreu por meio da aplicação de ficha de caracterização sociodemográfica e da Escala de Avaliação da Segurança do Paciente para Pacientes Crônicos em Hemodiálise. Foram realizadas análises descritivas das variáveis quantitativas e testes estatísticos Qui-Quadrado e Razão de Verossimilhança. **Resultados:** o estudo mostrou que 165 (91,2%) sujeitos receberam práticas de cuidado seguras, enquanto 16 (8,8%) receberam práticas de cuidado inseguras provenientes de duas (18%) clínicas de hemodiálise. Houve associação significativa entre jornada de trabalho ($p = 0,017$) e participação em treinamentos sobre segurança do paciente ($p = 0,005$) e práticas assistenciais. **Conclusão:** foram identificadas práticas não conformes de segurança do paciente associadas a fatores sociodemográficos da equipe de enfermagem. São necessárias intervenções direcionadas para melhorar a segurança dos pacientes nesses ambientes.

Palavras-chave: segurança do paciente; unidades hospitalares de hemodiálise; enfermagem em nefrologia; estudo de avaliação.

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INTRODUÇÃO

Patient safety (PS) is a global concern with immense challenges in promoting quality and safe care. Various strategies have been implemented to mitigate damages caused by inadequate practices in care services. However, achieving the desired safety threshold remains elusive due to the numerous factors involved in the healthcare process.[1]

Given the significance of this topic across diverse care scenarios, providing optimal care for individuals with chronic kidney disease undergoing dialysis is crucial due to the high prevalence of chronic kidney disease and the potential for various types of incidents to occur. In Brazil, the prevalence of chronic kidney disease cases is substantial, with 121,636 registered cases in 2019, and the Southeast region experienced the highest number of hospitalizations. Additionally, 15,084 deaths from the disease were reported in that year.[2]

The high prevalence of hemodialysis incidents underscores the need to reassess care processes and implement actions to identify and control risks. Patients undergoing dialysis treatment can face minor to life-threatening complications originating from chronic kidney disease and preexisting clinical conditions. Additionally, complications may arise due to the care provided, either related to the structure of hemodialysis clinics or errors in the work process.[3]A survey in Northeast Brazil revealed 1,110 adverse events (AE) over three months in 51 patients undergoing dialysis treatment.[4] Such data prompts questions about the circumstances and inherent factors in care practices contributing to AE occurrences in healthcare services.

It is reasonable to assert that these events have a multifactorial cause, resulting from a chain of weaknesses in the entire organizational system of the service. Regarding the types of adverse events identified during hemodialysis, the literature mentions hypotension, hypertension, vertigo, chills, fistula thrombosis,[5] and specifically associated with vascular access, bleeding, and infection.[3]

To mitigate such adverse events, researchers and healthcare professionals must ascertain the root causes by assessing the patient safety level of hemodialysis clinics and identifying the primary errors committed during the care process, along with the main associated factors. However, despite this need, the scientific literature remains limited in providing such variables. A tool for measuring patient safety in hemodialysis settings has been developed recently, the Patient Safety Assessment Scale for Chronic Patients in Hemodialysis (PASAFE-HD), developed by Brazilian researchers in 2021.[6]

In a pilot study, researchers assessed the safety level of three hemodialysis clinics and identified discrepancies in patient safety standards, particularly concerning patient identification, communication between professionals, and infection prevention. Furthermore, the authors inferred that patients' and health professionals' sociodemographic and clinical factors were linked to the institution's safety level.[7]

Despite these significant findings, the study's scope is limited as it was conducted in only one Brazilian capital city. Consequently, there is a need for studies encompassing a larger number of clinics in various geographic regions and operating under diverse administrations. Hence, the present study aims to analyze patient safety in hemodialysis clinics in Northeastern Brazil.

MATERIALS AND METHODS

This is an observational, analytical, and cross-sectional quantitative study wherein the researcher observes, describes, and documents the analyzed situation, collecting and evaluating data at a specific time. This approach offers advantages in terms of cost-effectiveness and ease of control. Conducting this method is justified because the independent variable cannot be manipulated.[8]

The study involved 181 nursing professionals (166 nursing technicians and 15 nurses) selected from 11 hemodialysis clinics in Fortaleza, Brazil. All professionals providing care to patients with chronic kidney disease affiliated with the analyzed clinics were included. Professionals on vacation or maternity leave during the data collection period were excluded.

The study includes the following variables: location, age, gender, ethnicity, educational level, occupation, family income, marital status, religion, time working at the institution, length of work in the field of hemodialysis, weekly workload, number of jobs, number of patients, and level of safety provided at the clinic. To measure patient safety in the hemodialysis clinics, we utilized the PASAFE-HD tool validated for construct in 2021, demonstrating a Cronbach's alpha of 0.78.[6]

The latest version of the scale comprises 15 items divided into three dimensions. Scores are categorized into four levels: 0 (not applicable), 1 (non-compliant), 2 (partially compliant), and 3 (compliant). The total score can range from a minimum of zero to a maximum of 45 points. When interpreting the total score, institutions with values equal to or less than 34 points have unsafe care practices during hemodialysis sessions, whereas scores above 34 indicate safe care practices.[6]

A pilot test was conducted with chronic kidney patients. This technique involves a small group of participants selected for convenience, enabling the researcher to analyze corrections and make improvements before commencing the main research, ensuring the study's quality enhancement.[9] The pilot test involved 12 health professionals who met the same inclusion and exclusion criteria as the study sample. The test was conducted during two hemodialysis sessions at a clinic in Fortaleza, Brazil. The observations from the pilot test were excluded from the final study.

Data was processed using SPSS version 20.0, with license number 10101131007. A descriptive analysis of quantitative variables was performed to study the sociodemographic characteristics. Following this, Chi-Square, Likelihood Ratio, and Student's t-tests were utilized to analyze the distribution of sociodemographic characteristics of professionals concerning safe and unsafe care practices during hemodialysis sessions.

Additionally, these tests were employed to examine the distribution of compliance standards for the PASAFE-HD items corresponding to safe and unsafe care practices.

To perform the statistical associations and correlations, explanatory variables that could clinically influence patient safety in hemodialysis clinics were selected. The statistical tests were conducted on the following variables from the health professionals' profiles: gender, marital status, level of education, family income, having more than one job, age, weekly workload, time of experience in hemodialysis, and size of the institution. Moreover, the present study strictly followed the ethical and legal principles outlined in Resolution 466-2012 of the Brazilian Health Council. It obtained approval from the Research Ethics Committee of the Federal University of Ceará under number 5.800.171, ensuring full compliance with ethical guidelines and regulations.

RESULTS

The study included 181 nursing professionals working in 11 hemodialysis clinics in Fortaleza, Brazil. Among the participants, 165 (91.2%) were nursing technicians, and 16 (8.8%) were nurses. As for the work location, 115 (63.5%) professionals were employed in hemodialysis clinics in the countryside. Most participants, 160 (88.4%), were female. In terms of ethnicity, 129 (71.3%) declared themselves as mixed race.

Regarding marital status, 92 (50.8%) participants had a partner. Regarding income, 142 (78.5%) reported earning between 1 and 2 minimum wages. Furthermore, 95 (52.5%) declared attending trainings on patient safety. The average age of the participants was 35 (9.8) years, while the average time working with hemodialysis was nine (9.0) years.

Among the professionals studied, 165 (91.2%) demonstrated safe care practices, while 16 (8.8%) exhibited unsafe care practices. These 16 professionals came from two hemodialysis clinics, representing 18%. One clinic, located in the capital, had an average score of 30 points, while the other clinic, situated in the countryside, had an average score of 32.

Analyzing the distribution of care practices among professionals based on safe and unsafe practices, we observed a significant association between two variables. Workload ($p = 0.017$) and prior participation in patient safety training ($p = 0.005$) were both significantly associated with the care practices of professionals.

Table 1. Distribution of professionals based on care practices in hemodialysis sessions (n = 181). Fortaleza, Brazil, 2022.

Variable	Unsafe		Safe		p-value
	n	%	n	%	
Location of study					0.123*
Capital	3	4.5	63	95.5	
Countryside	13	11.3	102	88.7	
Profession					0.702**
Nursing technician	15	9.1	150	90.9	
Nurse	1	6.3	15	93.8	
Gender					0.907**
Male	2	9.5	19	90.5	
Female	14	8.8	146	91.3	
Age group (years)	36.1±10.5		35.1±9.5		0.491***
20-29	5	8.5	54	91.5	
30-39	4	6.5	58	93.5	0.554**
40-49	6	14.3	36	85.7	
50-60	1	5.6	17	94.4	
Ethnicity					
White	4	13.3	26	86.7	0.571**
Mixed	9	7.0	120	93.0	
Black	2	11.8	15	88.2	
Asian	1	20.0	4	80.0	
Marital status					
Without a partner	10	11.2	79	88.8	0.264*
With a partner	6	6.5	86	93.5	
Time working in hemodialysis clinics (years)	9.6 ±9.0		8.6±8.9		0.478***
1 - 2	6	12.0	44	88.0	
3 - 5	2	5.9	32	94.1	0.439**
6 – 10	2	4.4	43	95.6	
11 – 42	6	11.5	46	88.5	
Weekly working hours					
20 - 40 hours	1	1.7	59	98.3	
41 - 75 hours	15	12.4	106	87.6	0.017*

*Chi-Square Test. **Likelihood Ratio. ***Student's t-test

Table 2. The compliance standards for PASAFE-HD items were distributed by safe and unsafe care practices in hemodialysis clinics (n = 181). Fortaleza, Brazil, 2022.

Variable	Unsafe n (%)	Safe n (%)	p-value*
Dimension 1 (Strategic procedures for error prevention)			
1 - Identification of the dialyzer with the patient's full name, date of birth, and the date of the system's first use; Dialysis lines with the patient's full name.			
Non-compliant	-	3 (100)	<0.0001
Partially compliant	16 (18.2)	72 (81.8)	
Compliant	-	90 (100)	
2 - Identification of the hemodialysis system box using at least two identifiers: patient's full name, date of birth, medical record number, and differentiation by shifts or serologies.			
Non-compliant	1 (100)	-	0.026
Partially compliant	1 (50.0)	1 (50.0)	
Compliant	14 (7.9)	164 (92.1)	
3 - Dialyzers are packaged in rigid containers that are easy to clean, individualized, and sealed with a lid.			
Compliant	16 (8.8)	165 (91.2)	-
4 - Before each session, a test is conducted using a reagent from the hemodialysis system to ensure the system is properly disinfected.			
Compliant	16 (8.8)	165 (91.2)	-
5 - Records of dialyzer fiber volume (priming) before first use, after each reprocessing, with usage count, date, and the responsible staff's signature.			
Partially compliant	3 (4.8)	60 (95.2)	0.139
Compliant	13 (11.0)	105 (89.0)	
6 - Health professionals change gloves before each new procedure, including dressings and handling of the hemodialysis system.			
Non-compliant	13 (100)	-	<0.0001
Partially compliant	3 (16.7)	15 (83.3)	
Compliant	-	150 (100)	
Dimension 2 (Organizational health management processes)			
7 - Intravenous medication administration is recorded using labels with the medication name, dose, date, time of dilution/aspiration, responsible professional's name, and patient's full name.			
Non-compliant	13 (24.5)	40 (75.5)	<0.0001
Partially compliant	3 (2.5)	117 (97.5)	
Compliant	-	5 (100)	
8 - Potentially dangerous drugs are packaged in an exclusive and identified location with restricted access and opening control.			
Non-compliant	13 (100)	-	<0.0001
Partially compliant	-	5 (100)	
Compliant	3 (1.8)	160 (98.2)	

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9 - Disposable insulators are used to measure arterial and venous pressure in the machine.			
Non-compliant	3 (16.7)	15 (83.3)	0.382
Partially compliant	-	4 (100)	
Compliant	13 (8.2)	91.8 (164)	
10 - A semiannual record is maintained for cleaning the drinking water reservoir, and it includes the signature of the responsible professional.			
Non-compliant	2 (25.0)	6 (75.0)	0.041
Partially compliant	1 (2.0)	49 (98.0)	
Compliant	13 (10.6)	110 (89.4)	
11 - A nursing station near the hemodialysis room provides easy access and clear visibility of all patients. It is equipped with all the necessary material resources for providing assistance.			
Non-compliant	-	37 (100)	<0.0001
Partially compliant	16 (37.2)	27 (62.8)	
Compliant	-	101 (100)	
Dimension 3 (Care practices for infection control)			
12 - Health professionals remove ornaments and use personal protective equipment (PPE).			<0.0001
Partially compliant	13 (65.0)	7 (35.0)	
Compliant	3 (1.9)	158 (98.1)	
13 - Health professionals practice hand hygiene before touching the patient, performing aseptic procedures, after exposure to body fluids, and after contact with surfaces close to the patient.			
Non-compliant	14 (63.6)	8 (36.4)	<0.0001
Partially compliant	2 (1.6)	120 (98.4)	
Compliant	-	37 (100)	
14 - Catheter and/or fistula dressings are performed using an aseptic technique.			
Non-compliant	13 (34.2)	25 (65.8)	<0.0001
Partially compliant	3 (3.1)	93 (96.9)	
Compliant	-		
15 - The floor is cleaned and dried at each hemodialysis session and as needed.			
Non-compliant	-	25 (100)	0.008
Partially compliant	1 (100)	-	
Compliant	15 (9.7)	140 (90.3)	

*Likelihood ratio test

Statistically significant associations were found between the compliance patterns of PASAFE-HD and safe and unsafe care practices. The variables showing associations were dialyzer identification (< 0.0001), system box identification (0.026), glove change (< 0.0001), use of labels to record the administration of intravenous medications (< 0.0001), packaging of potentially dangerous medications (< 0.0001), semiannual record of drinking water reservoir cleaning (0.041), presence of a nursing station near the hemodialysis room (< 0.0001), removal of ornaments and use of PPE (< 0.0001), hand hygiene (< 0.0001), use of an aseptic technique for dressing catheters and/or fistulas (< 0.0001), and floor cleaning and drying (0.008).

DISCUSSION

The present study identified that 165 (91.2%) professionals from the nursing team exhibited safe care practices, while 16 (8.8%) demonstrated unsafe care practices, coming from two (18%) hemodialysis clinics. These findings corroborate a study conducted in 2021 in three clinics located in Fortaleza, Brazil. According to the authors, one clinic (33.3%) did not comply with the patient safety level per the PASAFE-HD. These findings emphasize unsafe care practices in hemodialysis clinics, highlighting the need to implement ongoing training processes. Furthermore, the development of technologies and guidelines for health professionals and patients with chronic kidney disease undergoing hemodialysis should prioritize patient safety goals.[7]

The distribution of care by professionals, based on safe and unsafe practices, showed a significant association with variables such as workload (p = 0.017) and prior participation in patient safety trainings (p = 0.005). In a survey with 104 nurses, Canadian researchers revealed that a high workload is associated with low safety for chronic kidney patients in hemodialysis clinics.[10] In Brazil, nursing professionals seek to reduce their workload to 30 hours a week through draft bill no. 2295/2000. Work overload, uninterrupted shifts, poor employment conditions, frequent exposure to pain and suffering, and the devaluation of the profession contribute to reduced patient safety, mental illness, and professional attrition.[11]

Regarding ongoing participation in patient safety (p = 0.005), the findings underscore the importance of health education in hemodialysis clinics on patient safety. A literature review conducted by Brazilian researchers identified that training the health team and educating patients are reinforcing factors for patient safety in hemodialysis clinics.[12]

Furthermore, the study's findings identified a statistical association in the compliance pattern of the PASAFE-HD items with safe and unsafe care practices related to patient identification, infection prevention, and identification and packaging of potentially dangerous medications. In this regard, identifying the patient through dialyzers, dialysis lines, and the system box exhibited variations between professional practices, ranging from “non-compliant” to “compliant”.

A study conducted in Washington reviewing patient safety reports from 2016 to 2018 revealed that incorrect patient identification correlates with adverse events. The most common errors include not using two identifiers (39%) and performing a procedure on the wrong patient (31%). The researchers also highlighted problems in organizational policies and processes (42%).[13]

Concerning infection prevention, there is no standard compliance in professional assistance regarding changing gloves, removing adornments, using PPE, hand hygiene, performing dressings for catheters and/or fistulas using aseptic techniques, and cleaning and drying the floor. A cohort study with 79 dialysis patients in Italy found that the incidence rate of bloodstream infection in individuals with indwelling catheters was 0.52 per 1.000 catheter days. Infections were mainly caused by *Staphylococcus aureus* (35%) and *Staphylococcus epidermidis* (30%) in 30% of cases. The Italian researchers emphasized that reducing this type of infection requires correct hand hygiene and aseptic management of the indwelling catheter.[14]

Non-compliance with hand hygiene is also evident in a study conducted in São Paulo, where researchers identified 1,090 opportunities for hand hygiene during hemodialysis sessions, but the adherence rate was only 16.6%. Similarly, out of 510 observed opportunities for glove use, correct use was found in only 45%.[15] Therefore, continuing education on hand hygiene is suggested, along with reviewing and/or implementing standard operating protocols containing step-by-step instructions on catheter dressing techniques to train professionals and prevent such errors. Furthermore, there was no standard compliance in the half-yearly records of cleaning the drinking water reservoir. Evaluating this item is paramount to ensure patient safety in hemodialysis clinics, as water contamination is associated with infection-related care care.[16]

Atlanta, Chicago, and Denver researchers identified a multicentric outbreak of gram-negative bloodstream infections. They concluded that 58 cases of bloodstream infection were related to the presence of contaminated fluids and biofilms on the wall of the water reservoir. Additionally, 48 (83%) patients with chronic kidney disease required hospitalization. The predominant organisms were *Serratia marcescens* (n = 21) and *Pseudomonas aeruginosa* (n = 12).[17]

Moreover, patients on hemodialysis may experience alterations leading to postural instability and, consequently, risk for falls. A cross-sectional study with 131 patients showed a significant increase in the instability of patients after the hemodialysis session, especially those with diabetes (P < 0.023).[18] Regular cleaning and drying the floor at each hemodialysis session and whenever necessary reduces the possibility of infection and decreases the risk of falls among patients with chronic kidney disease.

Our study also revealed inconsistencies related to identifying and storing potentially dangerous drugs. As such, the findings indicate the presence of non-compliance in the assistance provided by nurses and nursing technicians in hemodialysis clinics.

These results support the implementation of educational and management measures with a primary focus on correctly identifying patients, preventing infection, and properly handling and storing potentially dangerous drugs.

The study has limitations, such as the inability to infer changes over time and the non-generalization of results, given that the data were only obtained in one Brazilian state and in clinics linked to the Brazilian Unified Health System. To expand the analysis, we suggest further studies with longitudinal analysis encompassing different Brazilian states and clinics linked to private companies.

CONCLUSION

Throughout this investigation, we identified that 165 professionals from the nursing team exhibited safe care practices, while 16 showed unsafe care practices originating from two hemodialysis clinics in Fortaleza, Brazil. There was a significant association between safety level, workload variables, and prior participation in patient safety trainings.

Furthermore, when considering the distribution of compliance standards for the PASAFE-HD items in hemodialysis clinics, we observed statistical differences between safe and unsafe care practices. Specifically, significant differences were found in the variables of dialyzer identification, system box identification, glove change, use of labels to record the administration of intravenous medications, packaging of potentially dangerous medications, semiannual record of cleaning the potable water reservoir, presence of a nursing station near the hemodialysis room, removal of ornaments and use of PPE, hand hygiene, dressing catheters and/or fistulas using an aseptic technique, and floor cleaning and drying. These findings highlight the importance of addressing these areas to improve patient safety in hemodialysis settings.

INTEREST CONFLICTS

The authors declare that there is no conflict of interest in carrying out this work.

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