Original Article

Diagnosis, results, and nursing interventions for patients with acute renal injury

Diagnósticos, resultados e intervenções de enfermagem em pacientes com lesão renal aguda

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Abstract

Objective: To identify prevalence and correlate diagnosis, results, and nursing interventions in patients with acute renal injury (ARI) who were hospitalized in an intensive care unit (ICU).

Methods: This was a cross-sectional study including 98 patients older than 18 years old with ARI who were undergoing hemodialysis treatment in the ICU . The study was carried out in an ICU a large public hospital located in the city of São Paulo, Brazil. For statistics analysis we used the SPSS v21.0 to estimate prevalence, the 95% of confidence interval and sample error of 0.05. Data were collected from March to July 2016 using structured interviews, anamnesis and physical exam of patients using an instrument designed by this study researchers. The main instrument was completed by the principal researcher. Nursing consultation lasted for approximately 30 minutes. Of the total sample, 10% was selected and checked randomly in order to evaluate data quality and atypical values. Two patients previously did a pilot test to verify whether information in the instrument achieved the objective of the study.

Results: The 98 participatns were aged ≥60 years (33%), men (60%), and classified as pre-renal injury (54%). Prevalent diagnosis was (100%) risk of infection, risk of inefficient gastrointestinal perfusion, risk of ineffective renal perfusion, risk of electrolyte imbalance, excessive fluid volume, and risk of imbalanced fluid volume. Results (100%) were: severity of infection, access for hemodialysis, tissue perfusion - abdominal organs, hydric balance, mobility, removal of toxins and renal function. Prevalent nursing interventions (100%) were: promotion against infection, control of infection, maintenance of access for dialysis, hydroeletrolitic control, urinary elimination control, acid-base control, electrolytic control, hypervolemia control, hydric control, hydric monitoring, respiratory physiotherapy, respiratory and positioning monitoring. Correlations were significant ($p < 0.001$) between diagnosis and nursing interventions and between nursing interventions and results.

Conclusion: Main diagnosis, results and nursing interventions related with loss of renal function originated from changes of renal perfusion, volemia, hydroelectrolytic dysfunctions, and risk of infection. The number of diagnosis showed to be correlated with number of nursing interventions and nursing interventions was correlated with results.

Resumo

Objetivo: Identificar prevalência de diagnósticos (DE), resultados (RE) e intervenções de enfermagem (IE) em pacientes com lesão renal aguda (LRA) internados em unidade de terapia intensiva (UTI). Correlacionar DE, RE e IE identificados.

Métodos: Estudo transversal, conduzido em Unidades de Terapia Intensiva de um hospital público de grande porte da cidade de São Paulo. Foram incluídos, numa amostra intencional, 98 pacientes com LRA em tratamento hemodialítico internados em UTI, maiores de 18 anos. Foi utilizado *software* SPSS v21.0 para estimação da prevalência, fixando a estimativa no intervalo de confiança (IC) de 95% e erro amostral de 0,05. A coleta de dados foi realizada por meio da consulta de enfermagem, composta de entrevista estruturada, anamnese e exame físico dos pacientes, utilizando instrumento elaborado pelos pesquisadores. A coleta de dados foi realizada no período de março a julho de 2016, e o instrumento de coleta de dados foi preenchido pela pesquisadora principal. A consulta de enfermagem teve duração de aproximadamente 30 minutos. Do total da amostra, 10% foi selecionada aleatoriamente e checada, com o propósito de avaliar a qualidade dos dados e valores atípicos. Foi também realizado teste piloto em dois pacientes, previamente, para verificar se as informações contidas no instrumento atingiriam os objetivos da pesquisa.

Resultados: Participaram 98 pacientes, predominantemente com idade ≥60 anos (33%), sexo masculino (60%) e classificados com lesão pré-renal (54%). DE prevalentes (100%): risco de infecção, risco de perfusão gastrointestinal ineficaz, risco de perfusão renal ineficaz, risco de desequilíbrio eletrolítico, volume de líquidos excessivos e risco de volume de líquidos desequilibrados. RE prevalentes (100%): gravidade da infecção, acesso para hemodiálise, perfusão tissular: órgãos abdominais, equilíbrio hídrico, mobilidade, remoção de toxinas e função renal. IE prevalentes (100%): promoção contra infecção, controle de infecção, manutenção de acesso para diálise, controle hidroeletrolítico, controle de eliminação urinária, controle ácido-básico, controle de eletrólitos, controle de hipervolemia, controle hídrico, monitorização hídrica, fisioterapia respiratória, monitorização respiratória e posicionamento. Correlações foram significativas ($p < 0,001$) entre DE e IE e entre IE e RE.

Conclusão: Os principais DE, RE e IE foram relacionados à perda da função renal, origem das alterações na perfusão renal, volemia, distúrbios hidroletroliticos e risco para infecção. O número de DE atribuídos mostrou-se relacionado ao número de IE, assim como, das IE aos RE.

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Conflicts of interest: none to report

Introduction

Acute renal injury (ARI) in patients hospitalized in the intensive care unit (ICU) has an incidence that ranges between 25%[1] and 57%,[2] and mortality around 60%.[3] The ARI is characterized by a sudden loss of renal function with reduced glomerular filtration rate that causes accumulation of nitrogen products, hydroeletrolytic and acid-base dysfuntions.[4-6]

In health care for patients with ARI the nursing process (NP) constitutes an important tool for nursing manage care, detailed care steps, and register procedures in patients' medical record. This process has five phases: nursing history/data collection, diagnosis, planning, implementation and nursing assessment.[7]

Nursing diagnosis is a cognitive process and it includes data collection and analysis, generation and assessment of hypotheses. Nursing assessment, decisions, and process of information must be accurate to generate diagnosis. The diagnosis supports the communication and decisions about expected results and interventions to achieve such results.[8] This study identified prevalence and correlated diagnosis, results and nursing interventions in patients with ARI who were undergoing hemodialysis in an ICU.

Methods

This was a cross-sectional study including 98 patients older than 18 years old with ARI who were undergoing hemodialysis treatment. The study was carried out in an ICU of large public hospital located in the city of São Paulo, Brazil. For statistical analysis we used the SPSS v21.0 software to estimate prevalence, 95% of confidence interval, and sample error of 0.05. Data were collected in nursing consultations using a structure interview, anamnesis and physical exam of patients. The instrument used was designed by this study researchers. Variables included were clinic, sociodemographic, diagnosis, results and nursing interventions needed in health care for patients with ARI.

Data were collected from March to July 2016 and information provided in instruments were completed by the principal researcher. Nursing consultation lasted for approximately 30 minutes. Patients and/or families members were invited to participate in the interview and those who agreed to participate signed the consent form. Consent form was composed by data related with anamnesis, physical exam, complementary exams and data from medical records. The questionnaire was applied upon admission in the ICU. After data collection we identified diagnosis, results and nursing interventions based on NANDA International classification (NANDA-I),[9] Nursing Intervention Classification (NIC)[10] and Nursing Outcomes Classification (NOC).[11]

Clinical and sociodemographic variables as well as diagnosis, results, and nursing interventions were analyzed using descriptive approach. Correlation between number of diagnosis, number of results, and number of nursing interventions was applied using the linear correlation test by Spearman's from SPSS software version 21.0.

Of the total sample, 10% was randomly selected and checked with to evaluate data quality and atypical values. A pilot test was previously done including two patients to verify whether information of instrument would achieve the objectives of the study.

This study adhered to principles for research on human subjects of resolution 466/2012 of the National Health Council.[12] The study was approved by the Ethical and Research Committee of Faculdade de Medicina de Botucatu da Universidade Estadual Paulista "Júlio de Mesquita Filho" (CAAE nº 53058316.0.0000.5411).

Results

This study included 98 patients with ARI who were undergoing hemodialysis treatment and were hospitalized in the ICU. Table 1 describes sociodemographic characteristics of participants of the study.

Table 1. Sociodemographic characteristics of participants with acute renal injury who were undergoing hemodialysis treatment in the intensive care unit

Variables	n(%)	Median (Max-Min)
Age		
18-30 years	8(8)	
31- 40 years	13(13)	
41-50 years	20(20)	
51- 60 year	25(26)	
Older than 60 years	32(33)	
Age (years)		55 (20-79)
Sex		
Male	59(60)	
Female	39(40)	
Region		
Sao Paulo	58(59)	
Other municipalities	35(36)	
Other states	3(3)	
Other country	1(1)	
Marital status		
Married	49(50)	
Single	35(36)	
Divorced	8(8)	
Widowed	3(3)	

In addition to diagnosis of ARI, each patient had more than one diagnosis as the main reason of hospitalization. Main diagnoses were related to bowel diseases (35, 36%) and respiratory tract infection (27, 28%).

Septic shock was seen among 38 patients (37%) and it contributed with appearance, evolve and severity of ARI. Pre-renal ARI classification was observed in 53 patients (54%) and it was related with hypovolemic and low blood flow.

Beginning of hemodialysis therapy occurred in the first 24 hours after admission in the ICU in 45 patients (46%). Continuous hemodialysis therapy was indicated for 66 patients (67%). Of these, 59 underwent (60%) venous hemofiltration continuously.

The hydric balance was positive in 52 patients (53%), the diuresis was presented in 73 (75%) of cases and use of diuretic in 31 patients (32%). Sedative was used in 53 patients who were totally dependent of nursing care, and 60 (61%) in the use of vasoactive drug. Sixteen six (68%) of patients underwent mechanical ventilation.

In general, in evaluation of patients we did not noticed severity and hemodynamic instability, 57 patients (61%) died.

Prevalent nursing diagnosis, defining, risk factors and related characteristics of these patients were described in table 2.

Table 3 includes diagnosis, results, and nursing interventions.

The diagnosis per patient in our study had a mean of 15 (minimal 8 - maximal 22), 3.7 (minimal 3 - maximal 4) of results, 40 of nursing interventions (minimal 23 - maximal 46). Correlation among diagnosis, results, and nursing interventions were significant between diagnosis and interventions ($r = 0.51$; $p< 0.001$) and between nursing interventions and results $r = -0.34$; $p=0.001$). No significant correlation was observed between diagnosis and results ($r = -0.18$; $p = 0.072$).

Discussion

We identified 9 diagnosis, 13 results and 27 nursing interventions prevalent among patients with ARI who are undergoing dialysis in the ICU. The identification of these results was due to need of define their possible contribution with clinical rationale of professionals and promotion of positive impact in care, prevention, and treatment of patients with this disease.

Participants were critically ill and hemodynamic instable, as a consequence they had a high mortality rate, 61% of cases. This rate agrees with rates found nationally and internationally.[13-16]

After define sociodemographic and clinical profile of patients, we observed prevalent diagnoses, most common were: risk of infection, risk of inefficient gastrointestinal perfusion, risk of inefficient renal perfusion, excessive fluid volume, risk of electrolytic imbalance, risk of imbalance fluid volume. These results are similar to other Brazilian studies that used Delphi's technique and identified five main diagnosis: decreased cardiac output, inefficient tissue perfusion - renal, impaired fluid volume, excessive fluid volume, and risk of infection.[17]

Other study including patients who were undergoing continuous renal replacement therapy (CRRT) identified in 100% of cases the diagnoses:

Table 2. Nursing diagnosis, defining characteristics, risk factors and factors related to patients with acute renal injury who were undergoing dialysis in the intensive care unit

Nursing diagnosis	(%)	Defining characteristics	(%)	Risk factors/ Related factors	(%)
Risk of infection	100	-	-	Invasive procedure	100
				Suppressed inflammatory response	100
				Reduction of Hemoglobin	97
				Compromised skin integrity	56
				Malnutrition	38
				Obesity	6
Risk of ineffective gastrointestinal perfusion	100	-		Renal disease	100
				Gastrointestinal disease	36
				Compromised liver function	34
				Diabetes mellitus	15
Risk of inefficient renal perfusion	100	-	-	Renal disease	100
				Exposure to nephrotoxins	93
				Blood hypertension	28
				Diabetes mellitus	15
				Trauma	15
				Burns	1
Excessive fluid volume	100	Hemoglobin and reduced hematocrit	97	Compromised regulatory mechanism	100
		Imbalance Electrolytic	62		
		Oliguria	67		
		Adventitious breath sounds	59		
		Edema	52		
		Intake higher than output	52		
Risk of electrolytic imbalance	100	-	-	Renal dysfunction	100
				Compromised regulatory mechanism	100
				Excessive fluid volume	100
				Vomiting	16
				Diarrhea	8
Risk for imbalanced fluid volume	100	-	-	Treatment regimen	100
				Sepsis	37
				Trauma	15
				Burns	1
Impaired gas exchange	61	Abnormal blood pH 61	67	Ventilation/perfusion relationship imbalance	100
		Cyanoses	40		
		Tachycardia	38		
		Abnormal breathing pattern	27		
		Abnormal Blood gases	10		
		Hypercapnia/hypoxemia	10		
Risk of bleeding	61	-		Treatment regimen	62
				Impaired liver function	47
				Trauma	13
Impaired skin integrity	60	Change in skin integrity	100	Mechanical factor	100
				Changes in fluid volume	100
				Impaired circulation	44
				Inadequate nutrition	42
				Hypothermia	17
				Hyperthermia	5

inefficient renal perfusion, excessive fluid volume, inefficient protection, decreased cardiac output, risk for compromised skin integrity, risk of infection and ineffective thermoregulation.[18]

A previous study defined the diagnosis profile of patients with chronic renal disease in hemodialysis, and its results resemble the results of our study, such as: risk of infection, risk for electrolyte imbalance, and excessive fluid volume. However, divergent diagnoses were: risk of vascular trauma, risk of impaired liver function, risk of unstable glucose, acute pain, insomnia and anxiety.[19]

The diagnosis of excessive fluid volume is frequent in patients in dialysis both chronically or acutely, the defining characteristics were also studied and investigated in a Brazilian study, and some

Table 3. Diagnosis, results, and nursing interventions of patients with acute renal injury in dialysis in the intensive care unit

Nursing diagnosis	(%)	Nursing results	(%)	Nursing interventions	(%)
Risk of infection	100	Severity of infection	100	Promotion against infection	100
				Control of infection	100
		Access for hemodialysis	100	Maintenance of dialysis access	100
Risk of inefficient gastrointestinal perfusion	100	Tissue perfusion: abdominal organs	100	Hydroetrolitic control	100
		Gastrointestinal function	69	Urinary elimination control	100
Inefficient risk of renal perfusion	100	Renal function	100	Acid-base control	100
				Hemofiltration therapy	66
				Hemodialysis therapy	35
		Removal of toxins	100	Urinary elimination control	100
		Electrolyte balance	71	Eletrolyte control	100
				Hidroeletrolyte control	100
Excessive fluid volume	100	Hybrid balance	100	Hypervolemia control	100
				Hydric control	100
				Hydric monitoring	100
Risk of electrolytic imbalance	100	Eletrolyte and acid-base balance	83	Acid-base control	100
				Eletrolyte control	100
Risk for imbalanced fluid volume	100	Severity of hydric overload severity	69	Hydric control	100
				Hypervolemia control	100
Impaired gas exchange	61	Respiratory status	64	Breathing physiotherapy	100
				Breathing monitoring	100
Risk of bleeding	61	Blood coagulation	98	Bleeding reduction	61
				Precaution against bleeding	61
				Blood products Administration	56
Impaired skin integrity	60	Wound cicatrization	67	Positioning	100
				Injuries care	64
				Pressure ulcer prevention	38
				Skin supervision	38

reported are similar to finding of our results, for example: electrolyte imbalance, adventitious breath sounds, edema and intake greater than output.[20]

Other study that included patients with short-term catheter for hemodialysis identified the following eight main diagnosis: risk for inefficient renal perfusion, impaired physical mobility, risk of syndrome of stress due to changes, risk of infection, impaired skin integrity, impaired tissue integrity, inefficient protection and risk for vascular trauma.[21]

NP is considered an instrument that allow nursing practice with clinical judgment and application of critical skills, metacognition, and critical thinking.[22] To nurses, results have a variety of meanings, among them, autonomy, valorization and recognition of a professional. In addition, NP contributes to quality of care, team working, and legal support.[23]

Based on our findings, we can affirm that participants had different particularities that required high nursing workload, we highlight the importance of structured NP to contribute with care quality and personalize care delivery for patients. Nursing work done based on scientific-technical knowledge and skills can promote improvement in care delivery by nursing teams and enhance their autonomy and professional knowledge.

Main results found in our study are related with patients with ARI in dialysis in the ICU were: severity of infection, access for hemodialysis, perfusion of abdominal organs, gastrointestinal function, hydric balance, removal of toxins, renal function, electrolyte and acid-base balance, severity of hydric overload, respiratory status, blood coagulation and wound cicatrization. These results are strongly associated with reduced renal function and to a number of physiologic changes. We did not find studies that analyzed results in population similar to our in order to compare results.

Nursing interventions in this study were: promotion against infection, infection control, maintenance of dialysis access, hydric control, acid-base control, urinary elimination control, hypervolemia control, hemofiltration therapy, hemodialysis therapy, respiratory physiotherapy, electrolytic control,

hybrid monitoring, respiratory monitoring, reduction of bleeding, bleeding precaution, blood products administration, positioning, care with injuries, pressure ulcer prevention, and skin supervision.

Among different nursing actions to these patients we highlight three fundamental points. The first one, care with catheters: dressing, monitoring of bleeding and hematomas, observe presence of phlogistic signs, heparin injection in routes after use, exclusive use of catheter in CRRT and extension occlusion. Second, care with circuit: to prepare equipment to completely self-test, verify connections of catheter extension, verify if clamping of routes exist, monitor every hour the parameter of equipment that perform the circuit change every 72 hours. The third, care with patient: verify level of conscience, hemodynamic monitoring, control of laboratorial exams and change in decubitus to avoid pressure injuries.[24]

A literature review pointed out some nursing interventions to prevent and treat ARI in ICU that corroborate with our study: prevent shock, hemodynamic regulation, hydroelectrolytic control, acid-base control, infection control, hypovolemic control, cardiac control, embolism precautions, respiratory monitoring.[25]

ARI prevention includes some key points such as identification risk factors for development of ARI such as previous chronic diseases, congestive cardiac insufficiency, hypertension, coronary arteriosclerosis, acidosis, nephrotoxic exposition, sepsis, mechanical ventilation and anemia. Early diagnosis from serum creatinine and urine creatinine.[26]

After diagnosis the priority is volemia maintenance and correction of volume depletion, however it is need to provide attention for not causing positive hydric balance because it is associated with high mortality. To monitor urine output there is a need of rigorous hydric balance, hemodynamic monitor and oxygenation. To be attentive to nephrotoxic drugs and correct the dose for patients with altered renal function.[26]

Indication for renal replacement therapy includes factors such as hypervolemia, electrolytic and acid-base change. Modalities depend on socioeconomic conditions of the institution, country, and health system, in addition to specific reasons as medical equipment and specialized and/or trained team.

Nursing knowledge for early diagnosis of ARI has been studied because a competent behavior is expected in its prevention and treatment. We conclude that nurses working in admission units, intensive care, emergency both in private or public institutions do not have enough knowledge to perform assessment and measures that guarantee conditions for prevention, diagnosis, identification of signs and symptoms of ARI. Our results showed that implementation of actions is paramount in terms of continuing education and also the need of training and development of these skills among nursing professionals.[27]

There are results showing insecurity of health professionals to diagnosis and treat ARI. The limited knowledge about the subject reinforces the need of actions that support medical and nursing team actions.[28]

A study pointed that training of nursing team about ARI promoted knowledge and management of ARI, and such training showed higher impact after three months of educational intervention.[29]

A trained nursing team can assist patients with ARI who are undergoing CRRT in ICU. In addition, skilled nursing team is associated with reduction of mortality among patients because well trained nurses are able to solve problems related with equipment, improve therapy management, and consequently, improve clinical effects. There are evidences that a trained team can reduce length of hospital stay, interruptions in extra-body circuit, promote less unnecessary changes of filter, and, therefore, increase of dialysis dose provided based on medical prescription.[30]

We observed an increase in number of diagnosis correlated with increase of nursing interventions, however, the growth of nursing intervention is related with decrease in results. In other words, the increase of number of diagnoses per patient will not increase nursing interventions, however, the increase of nursing interventions per patient reduces the number of results. Further studies are warranted to investigate the relationship found

considering the reasonable results report in our study. Results that generate multiple interventions are frequent, as well as, results that generate specific interventions. Our results reflect in the high workload faced by nursing team as well as on the high cost of hospital care.

Conclusion

We conclude that profile of patients with ARI who were undergoing dialysis in the ICU was that most of them were men (60%), aged older than 60 years (33%), and primary diagnosed with gastrointestinal tract disease (36%). Sepsis was observed in 37% of cases. Most frequent renal injury type was pre-renal in 54% of patients, and replacement renal therapy was needed in the first day after admission in the ICU (46%), the prevalent modality of treatment was continuous therapy (67%). These patients had severe hemodynamic, all were dependent of nursing care, 68% needed mechanical ventilation, 61% vasoactive drugs, and 54% sedatives. A high rates of mortality among patients was seen (61%). Main diagnoses, results, and nursing interventions were related with loss of renal function and changes in renal perfusion, volemia, hydroelectrolytic disorders and, consequently, higher expose of patients to invasive procedures and higher risk of infections. Diagnosis observed in 100% of patients were: risk of infection, risk of gastrointestinal inefficient perfusion, risk of inefficient renal perfusion, risk of electrolytic imbalance, excessive fluid volume, risk for imbalance fluid volume. Results in 100% of patients were: infection severity, access for hemodialysis, tissue perfusion: abdominal organs, hydric balance, mobility, removal of toxins and renal function. Nursing interventions seen in 100% of patients were infection prevention, infection control, maintenance of access for dialysis, hydroeletrolytic control, urine elimination control, acid-base control, electrolyte control, hypervolemia control, hybrid control, hydric monitoring, respiratory physiotherapy and positioning. Based on scarcity of studies on the topic in national and international literature, this study adds for promoting a broadening of the subject related with NP to population included in our study. In addition, we observed among them a high demand of nursing care. Further studies are warranted to investigate not only prevalence of diagnosis, but also association between nursing time and value-added to hospitals. Studies should also investigate accuracy of diagnostic assessment.

Collaborations

Grassi MF, Dell'Acqua MCQ, Jensen R, Fontes CMB and Guimarães HCQCP declared to contribute with conception of the study, analysis and interpretation of data, drafting the manuscript and critical review relevant for the content and final approval of version to be published.

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