



Acta Paulista de Enfermagem

ISSN: 0103-2100

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Universidade Federal de São Paulo  
Brasil

Rosendo da Silva, Richardson Augusto; Bezerra, Moiziara Xavier; de Souza Neto, Vinicius Lino; Dinorah Sa Mororo, Deborah; Cardoso Fernandes de Andrade, Itáisa  
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Acta Paulista de Enfermagem, vol. 30, núm. 1, enero-febrero, 2017, pp. 73-79  
Universidade Federal de São Paulo  
São Paulo, Brasil

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# Children with kidney diseases: association between nursing diagnoses and their diagnostic indicators

Crianças com doenças renais: associação entre diagnósticos de enfermagem e seus componentes

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## Keywords

Nursing process; Nursing diagnosis; Pediatric nursing; Kidney disease; Child; Interview

## Descritores

Processos de enfermagem; Diagnósticos de enfermagem; Enfermagem pediátrica; Nefropatia; Criança; Entrevista

## Submitted

October 25, 2016

## Accepted

February 24, 2017

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DOI: <http://dx.doi.org/10.1590/1982-0194201700011>



## Abstract

**Objective:** To identify the nursing diagnoses in children with kidney diseases, and to analyze the association between these diagnoses, their defining characteristics, related or risk factors.

**Methods:** A cross-sectional, quantitative study, conducted with 68 hospitalized children in a university hospital in northeastern Brazil. An interview guide and physical examination was used to collect data. The selection of diagnoses was procedural, and the data were analyzed using descriptive and inferential statistics.

**Results:** Thirteen diagnoses were identified. The most frequent diagnoses presented statistically significant association with their diagnostic indicators and were found in the domains of health promotion, elimination/exchange, nutrition, safety/protection and activity/rest.

**Conclusion:** The most prevalent nursing diagnoses were: *excess fluid volume*, *risk for infection*, impaired urinary elimination, *fatigue*, and *ineffective protection*. In general, the defining characteristics and the related/risk factors of the diagnosis showed significant association.

## Resumo

**Objetivo:** Identificar os diagnósticos de enfermagem em crianças com doenças renais e analisar a associação entre esses diagnósticos, suas características definidoras e os fatores relacionados ou de risco.

**Métodos:** Estudo transversal, quantitativo, realizado com 68 crianças internadas em um Hospital Universitário no Nordeste do Brasil. Para a coleta de dados foi utilizado um roteiro de entrevista e exame físico. A elaboração dos diagnósticos foi processual e os dados foram analisados por meio da estatística descritiva e inferencial.

**Resultados:** Identificaram-se 13 diagnósticos. Os mais frequentes tiveram relação estatisticamente significativa com seus componentes e estavam inseridos nos domínios promoção da saúde, eliminação/troca, nutrição, segurança/proteção e atividade/repouso.

**Conclusão:** Os diagnósticos de enfermagem mais prevalentes foram *volume de líquidos excessivo*, *risco de infecção*, *eliminação urinária prejudicada*, *fadiga* e *proteção ineficaz*. Em geral, as características definidoras e os fatores dos diagnósticos apresentaram associação significativa.

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**Conflicts of interest:** there are no conflicts of interest regarding the publication of this paper.

## Introduction

Kidney diseases, such as primary or secondary glomeruli, congenital abnormalities, urinary infection, and tubular diseases are among the most common in children.<sup>(1)</sup> If not identified and treated early, they can lead to severe complications due to recurrent clinical changes, requiring dietary changes, dialysis therapy, invasive procedures, constant use of medications, frequent hospitalizations, and separation from family life.<sup>(2,3)</sup>

In spite of this, the care of children with kidney diseases requires professionals with skills and competences in the identification of the priority needs for the planning of care, optimizing of behaviors, and attainment of goals that promote the reestablishment of health, decreasing patient encounters with the health service, and promoting their quality of life.<sup>(4)</sup>

Nursing care for children with kidney diseases can be based on the nursing process (NP) and on the use of standardized languages, as a way to meet the real needs of this clientele. The NP include the nursing diagnosis stage, which constitutes an important focus of professional practice, as potential risks will be identified through its use, and nursing care will be adjusted.<sup>(3,4)</sup>

The identification of nursing diagnoses involves clinical reasoning about the individual's health status, the use of data obtained by the interview and physical examination. A careful analysis of the client's health situation supports the identification of the patient needs which require specific interventions.<sup>(5,6)</sup> Therefore, a good clinical judgment about the manifestations presented is essential, as well as the correct identification of the diagnostic indicators of the nursing diagnoses.

Studies on the association between nursing diagnoses and their defining characteristics, related and risk factors in specific populations are fundamental for the nurse's clinical practice. These studies allow us to test the hypothesis that a relationship between the statements and their diagnostic indicators exist, besides making pos-

sible the determination of their predictive capacity, increasing the reliability of the process of diagnostic inference; these facts justify the present study.

From this context, the question is: what are the nursing diagnoses present in children with kidney disease? Is there an association between the diagnoses, their defining characteristics, related and risk factors? Thus, the purpose of this study was to identify nursing diagnoses in children with kidney diseases and to analyze the association between these diagnoses, their defining characteristics, and related or risk factors.

## Methods

This was a quantitative, crossover study, conducted with 68 hospitalized children in a pediatric health care unit (Unidade de Atenção a Saúde da Criança - UASC) of a university hospital, and located in the northeastern region of Brazil. The population size was based on the arithmetic mean of hospitalizations of children with a medical diagnosis of kidney disease in the unit, during the last five years (2010 to 2014), totaling 220 patients.

For the sample calculation the formula for finite populations was used, considering the confidence coefficient, the sample error, complementary percentage (100-P) and the prevalence. The parameters considered were the confidence level of 95% ( $Z_{\infty} = 1.96$ ), the sample error of 5%, and a population of 220 patients.

In the absence of a study estimating the prevalence of association of nursing diagnoses and their diagnostic indicators for children with kidney diseases, a conservative value of 50% was considered. At the end, a sample of 68 children was obtained.<sup>(7)</sup>

The convenience sample selection occurred consecutively, with the following criteria adopted: children up to ten years of age, with medical diagnosis of kidney disease, who were hospitalized during the data collection period. The exclusion criteria were: children who, in addition

to kidney diseases, presented other diseases, such as neoplasias, infectious diseases, neurological diseases and mental disorders.

All those responsible for the children who participated in the study signed the Terms of Free and Informed Consent Form.

The data collection occurred between June and December of 2015, in the identified unit, by means of physical examination and interview guide. These instruments included socio-demographic and clinical data, as well as defining characteristics (signs and symptoms), risk/related factors subdivided into the 12 domains (Health promotion, Nutrition, Elimination and Exchange, Activity/Rest, Perception/cognition, Self-perception, Roles relationships, Sexuality, Coping/Stress tolerance, Safety/protection and comfort) present in taxonomy II of nursing diagnoses from NANDA International (NANDA -I).<sup>(8)</sup>

The instruments were evaluated by 38 expert nurses. The search for experts occurred through a review of the curriculum vitae in the Lattes platform of the National Council for Scientific and Technological Development (Conselho Nacional de Desenvolvimento Científico e Tecnológico - CNPq). The inclusion criteria were: professional nurse, graduate level education (specialization, master's or doctorate), related to nursing diagnosis with patients with chronic kidney failure, or having academic specialization in the area; and, as exclusion criterion, solely having undergraduate research with an end-of-course written paper on the subject.

The contact with the specialists occurred via e-mail, by means of an invitation letter and the Terms of Free and Informed Consent form. Their task was to validate the instruments regarding appearance, content, clarity and applicability. They were also requested to provide any suggestions and modifications they considered pertinent. The items that achieved an index of concordance  $\geq 0.80$  were considered validated among the specialists.<sup>(9)</sup>

After the adjustments made to the instrument, a pre-test was applied with 10% of the study sample, to verify if the instruments met the research objectives. Since no need for in-

strument changes was necessary, the pretest participants' responses were included in the study sample.

The diagnosis identification was procedural, conducted simultaneously with the data collection, seeking to identify the defining characteristics and related/risk factors according to NANDA-I, version 2015-2017. The Risner's clinical judgment stages were followed for structuring of nursing diagnoses.<sup>(10)</sup>

In the process of diagnosis inference, the clinical information was individually evaluated by two authors of this article, one being a master's-prepared nurse and the other holding a doctoral degree, in order to achieve greater reliability of the results. The diagnoses that showed agreement between them were accepted. Those in which there was disagreement among the evaluators were referred to three nursing professors, who worked in the referred service, and who were specialists in nephrology, until a consensus was achieved.

Then, a database was developed using Microsoft Excel 2009 software, and all the variables obtained in the research instruments were entered, such as the respective nursing diagnoses, defining characteristics, and the identified related and risk factors.

Subsequently, the data were compiled and processed using the IBM Statistical Package for the Social Sciences (SPSS), version 20.0 for Windows. Central tendency measurements and the Shapiro-Wilk test were performed for the nursing diagnoses, to verify the normality of distribution at a significance level of 5%. The Pearson's Chi-square test and Fisher's exact test were used to verify the association of nursing diagnoses with the defining characteristics and related factors, considering a significance level of 5%.

The development of the study met the standards of ethics in research involving human beings, and received registration of the Certificate of Presentation for Ethical Appreciation (Certificado de Apresentação para Apreciação Ética - CAAE) 42666815.0.0000.5292.

## Results

Among the 68 patients, the age range was 2 - 10 years, with a mean age of 7 years (SD:2.81), male (51.40%), resident of the state (67.80%), presenting as main complaints: fever (80.20%), edema (55.10%), pain when urinating (60.30%), urine with abnormal coloration (75.10%), lack of appetite (50.35%), weight gain (70.20%), and fatigue (50.15%). The kidney diseases identified were: nephrotic syndrome (35.25%), hydronephrosis (15.50%), and acute diffuse glomerulonephritis (AGN) (49.25%).

The Shapiro-Wilk test presented a value of 0.041, evidencing an asymmetric (abnormal) distribution. Thus, 13 nursing diagnoses were identified, and the most prevalent were: *excess fluid volume*, *risk of infection*, *impaired urinary elimination*, *ineffective protection* and *fatigue*. Table 1 shows the 13 diagnoses identified, with their respective frequencies and percentages.

**Table 1.** Distribution of nursing diagnoses identified in children with kidney diseases (n=68)

Nursing diagnoses	n(%)
Excess fluid volume	62(91.17)
Risk for infection	60(88.23)
Impaired urinary elimination	55(80.88)
Ineffective protection	40(58.82)
Fatigue	35(51.47)
Hyperthermia	25(36.76)
Acute pain	20(29.41)
Risk for disproportionate growth.	16(23.52)
Risk for delayed child development	16(23.52)
Disturbed sleep pattern	14(20.58)
Constipation	10(14.70)
Imbalanced nutrition: less than body requirements	10(14.70)
Diarrhea	08(11.76)

Regarding the defining characteristics, table 2 presents their respective prevalence, as well as their associations with nursing diagnoses, identified in children with kidney diseases.

Table 3 shows the associations between nursing diagnoses and their related risk factors in children with kidney diseases.

**Table 2.** Distribution of the association between nursing diagnoses and defining characteristics, identified in children with kidney diseases (n=68)

Nursing diagnoses	Defining characteristics	Present(%)	Absent(%)	p-value
Excess fluid volume	Weight gain over short period of time	60(96.77)	2(03.23)	0.001*
	Edema	60(96.77)	2(03.23)	0.001 <sup>†</sup>
	Alteration in blood pressure	25(40.32)	37(59.68)	0.001 <sup>†</sup>
	Anasarca	6(09.68)	56(90.32)	0.004 <sup>†</sup>
Impaired urinary elimination	Dysuria	53(96.36)	2(03.64)	0.002 <sup>†</sup>
	Urinary retention	50(90.90)	5(09.10)	0.001 <sup>†</sup>
	Hesitancy	50(90.90)	5(09.10)	0.002 <sup>†</sup>
	Urinary urgency	2(03.64)	53(96.36)	0.004 <sup>†</sup>
Ineffective protection	Deficient immunity	36(90.00)	4(10.00)	0.001 <sup>†</sup>
	Fatigue	32(80.00)	8(20.00)	0.002 <sup>†</sup>
	Weakness	32(80.00)	8(20.00)	0.001 <sup>†</sup>
Fatigue	Tiredness	32(91.43)	3(08.57)	0.001 <sup>†</sup>
	Insufficient energy	26(74.28)	9(25.72)	0.002 <sup>†</sup>
Hyperthermia	Skin warm to touch	25(100.0)	0(00.00)	0.301 <sup>†</sup>
	Irritability	18(72.00)	7(28.00)	0.079 <sup>†</sup>
	Expressive behavior	19(95.00)	1(05.00)	0.082 <sup>†</sup>
Acute pain	Facial expression of pain	19(95.00)	1(05.00)	0.232 <sup>†</sup>
	Proxy report of pain behavior/ activity changes	14(70.00)	6(30.00)	0.087 <sup>†</sup>
	Alteration in sleep pattern	10(71.43)	4(28.57)	0.079 <sup>†</sup>
Disturbed sleep pattern	Difficulty initiating sleep	8(57.14)	6(42.86)	0.240 <sup>†</sup>
	Abdominal pain	8(40.00)	2(60.00)	0.318 <sup>†</sup>
	Insufficient interest in food	9(90.00)	1(10.00)	0.160 <sup>†</sup>
Constipation	Pale mucous membranes	9(90.00)	1(10.00)	0.071 <sup>†</sup>
	Diarrhea	8(80.00)	2(20.00)	0.096 <sup>†</sup>
	Food intake less than recommended daily allowance	8(80.00)	2(20.00)	0.452 <sup>†</sup>
Imbalanced nutrition: less than body requirements	Abdominal pain	8(80.00)	2(20.00)	0.182 <sup>†</sup>
	Diarrhea	8(100)	0(00.00)	0.160 <sup>†</sup>
	Abdominal pain	8(100)	0(00.00)	0.452 <sup>†</sup>

\*Fisher exact test; <sup>†</sup>Pearson chi-square test; p < 0,05

**Table 3.** Distribution of the association between nursing diagnoses, related and risk factors identified in children with kidney diseases (n=68)

Nursing diagnoses	Related / risk factors	Present(%)	Absent(%)	p-value
Excess fluid volume	Compromised regulatory mechanism	60(96.77)	2(03.23)	0.001*
Risk for infection	Invasive procedure	45(75.00)	15(25.00)	0.001†
	Immunosuppression	36(60.00)	24(40.00)	0.001†
	Decrease in hemoglobin	23(38.33)	37(61.67)	0.001†
	Alteration in skin integrity	17(28.33)	43(71.67)	0.003†
	Chronic illness	17(28.33)	43(71.67)	0.004†
Impaired urinary elimination	Multiple causality	48(87.27)	7(12.73)	0.001†
	Urinary tract infection	8(14.54)	47(85.46)	0.002†
Ineffective protection	Abnormal blood profile	23(57.50)	17(42.50)	0.001†
	Immune disorder	36 (90.00)	4(10.00)	0.001†
Fatigue	Physiological condition	32(91.43)	3(08.57)	0.001†
	Environmental barrier	8(22.85)	27(77.15)	0.003†
Hyperthermia	Illness	25(100)	0(00.00)	0.099†
Acute pain	Biological injury agent	14(70.00)	6(30.00)	0.247†
Risk for disproportionate growth	Chronic illness	16(100)	0(00.00)	0.507†
	Economically disadvantaged	10(62.50)	6(37.50)	0.085†
	Infection	8(50.00)	8(50.00)	0.096†
	Chronic illness	16(100)	0(00.00)	0.507†
Risk for delayed development	Treatment regimen	16(100)	0(00.00)	0.085†
	Inadequate nutrition	10(62.50)	6(37.50)	0.146†
	Environmental barrier	8(57.14)	6(42.86)	0.829†
Disturbed sleep pattern	Pharmaceutical agent	8(40.00)	2(60.0)	0.365†
	Recent environmental change	8(40.00)	2(60.0)	0.118†
Imbalanced nutrition: less than body requirements	Insufficient dietary intake	8(80.00)	2(20.00)	0.160†
	Diarrhea	Infection	8(100)	0(00.00)
	Treatment regimen	8(100)	0(00.00)	0.143†

\* Fisher exact test; † Pearson chi-square test; p &lt; 0,05

## Discussion

The nursing diagnosis of *excess fluid volume* was associated with weight gain over a short period of time, edema, and change in blood pressure, anasarca, change in respiratory pattern, anxiety, and was related to the regulatory mechanisms involved. In patients with kidney impairment, the cause for this fluid imbalance arises from a decrease in the glomerular filtration rate, which may be due to destruction of the glomerular capsule by the immune system, recurrent infections and loss of protein.<sup>(11)</sup>

Kidney diseases can modify glomerular filtration, reducing the capacity of water excretion. In addition, the production of urine can be impaired, resulting in accumulation of fluids in the body, contributing to increased weight in a short period of time.<sup>(12)</sup>

Most of the children studied had elevated urea and creatinine, as well as cystatin C, a protein marker against renal preservation, showing that the compensatory mechanisms were imbalanced. In view

of such changes, planned care on the part of the nurse is important, in order to control the hydro-electrolytic balance, hypervolemia, weight, and to ensure monitoring of the vital signs and nutrition to achieve fluid balance and preservation of renal function.<sup>(13)</sup>

The nursing diagnosis, *impaired urinary elimination*, was associated with dysuria, urinary retention, hesitancy, urinary urgency, urinary tract infection, and multiple causation etiologies. Kidney disease directly affects the diuresis process, resulting in the accumulation of nitrogenous and liquid excreta, which overload the vascular system, developing vascular congestion, dysuria, retention and hesitancy.<sup>(14)</sup>

In addition, some children underwent bladder catheterization, with the main objective of achieving better fluid control and attenuating the signs and symptoms of urinary discomfort.<sup>(15)</sup> Thus, it is fundamental that the nurse, performing actions such as guiding the mothers about the importance

of performing correct and frequent intimate hygiene, explain the reason for the use of the device, its permanence and the risk of infection.<sup>(16)</sup>

*Risk for infection* was also one of the diagnoses identified in children with kidney diseases, related to invasive procedures, increased environmental exposure to pathogens, chronic disease, malnutrition and pharmaceutical agents (immunosuppressants).

A high level of leukocytes was found in the children, with an average of 12,000/mm<sup>3</sup>, hyperthermia and, in some cases, the dialysis access presented phlogistic signs, characterizing an infectious focus at the insertion site of the catheter.

It is important to emphasize that the hospitalization process itself places children in a state of vulnerability, exposing them to a diversified microbiota, affecting the immune system. In addition to the hospital setting, invasive procedures increase the risk of opportunistic infections.<sup>(17)</sup> Thus, for this diagnosis, the goal is to maintain an adequate immune status (natural and acquired resistance). Infection prevention and control require technical and behavioral measures, affecting quality of health and a consequent reduction in effort, sequelae, complications and costs.<sup>(15)</sup>

The nursing diagnosis, *fatigue*, demonstrated an association with the defining characteristics of tiredness, and a report of constant insufficient energy; related factors included disease states and impaired physical condition. The mean hemoglobin level was 9.4 g/dl in the studied patients, below the 11.5 to 14.8 g/dl level, which is justified by the pathophysiology of renal diseases. Thus, oxygen diffusion becomes impaired, leading the cells to produce large amounts of lactic acid, causing the saturation of the muscle fiber and consequent fatigue.<sup>(18)</sup>

The decrease in hemoglobin in patients with renal disease is related to the lack of erythropoietin production. In addition to this deficiency, the majority of children showed folate levels and a cyanocobalamin index below the standard, which also participates in the process of red blood cell formation.<sup>(19)</sup>

Fatigue directly affects the activities of daily living (ADL), reducing the functionality of patients.<sup>(17-19)</sup> Thus, one of the goals of the plan of care is

to maintain activity tolerance, characterized by responses to body movements that consume energy, which are involved in everyday activities. In this sense, nursing interventions include the promotion of light exercise, guidance on maintaining a rhythm for activities, sleep hygiene, and supplementation with foods rich in folate (folic acid) and cyanocobalamin (vitamin B12) that contribute for maturation of red blood cells.<sup>(20)</sup>

On the other hand, the diagnosis of *ineffective protection* has been associated with the defining characteristics of deficient immunity, fatigue and weakness, and with the related factors of abnormal blood profile and immunological disorders. As already mentioned, the presentation of fatigue and weakness in these patients stems from a decrease in hemoglobin, which contributes to anemia and the symptoms of dyspnea and weakness in the individual.

In addition, immunity in individuals with kidney disease is compromised due to uremia, inflammation, decreased erythropoietin production, and malnutrition.<sup>(21)</sup> Patients with chronic kidney failure have low immunity as a direct result of loss of kidney function. Thus, the mechanisms involved in the inadequate immune response are related to the improper elimination of suppressive diagnostic indicators, as well as the impaired metabolism in the damaged kidney parenchyma.<sup>(21-23)</sup>

In this sense, the nurse should establish the improvement of the immunological status as a goal, and implement interventions such as risk identification, protection against infection, evaluation of laboratory tests, observing for signs and symptoms of infection, and guiding the nutritional supplementation of foods high in vitamin A, C, E, folate, zinc and selenium.<sup>(20)</sup>

## Conclusion

Thirteen nursing diagnoses were identified in children with kidney diseases. The most frequent were: *excess fluid volume*, *risk for infection*, *impaired urinary elimination*, *fatigue* and *ineffective protection*. The study enabled the verification of a statistically significant association between these nursing di-

agnoses and their respective diagnostic indicators, which were identified in these patients. The limitations of this study consist of the fact that clinical evaluation is a subjective process, and the diagnosis is subject to uncertainties. On the other hand, the study has strengths, which must be highlighted. The identification of NDs and their respective diagnostic indicators is essential, in practice, to establish the specific nursing interventions aimed at the specific needs of children with kidney diseases. In addition, the association of nursing diagnoses and their diagnostic indicators, in children with kidney disease, can contribute to the development and visibility of the nursing knowledge as a science, and to highlight aspects that demand the skill, education and abilities of the professionals who work in the area of pediatric nephrology nursing so that, together with the multiprofessional team, they may collaborate significantly in the care process.

### Collaborations

Silva RAR and Bezerra MX contributed to the study design, analysis, data interpretation, article writing, relevant critical review of the intellectual content, and final approval of the version to be published. Andrade ICF, Mororo DDS and Souza Neto VL contributed to the analysis, data interpretation, article writing, relevant critical review of the intellectual content, and final approval of the version to be published.

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