# CARE FOR THE NEWBORN WHO RECEIVED PERITONEAL DIALYSIS: CHALLENGES FOR THE NURSING TEAM

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**ABSTRACT:** This study aimed to characterize newborns with Acute Kidney Injury and who needed peritoneal dialysis in a neonatal intensive care unit in the south of Brazil, in the period 2007 – 2010. To this end, a descriptive study of the case study type was undertaken in the first semester of 2012, based on a search for data in medical records, collected using a structured instrument. A total of 10 newborns with Acute Kidney Injury was identified; of these, two underwent peritoneal dialysis, as they were extremely premature. However, they presented complications and died. It is concluded that knowing the problems in the care in peritoneal dialysis leads to an understanding of the need for professional training and continuous education in the neonatal health services.
**DESCRIPTORS:** Kidney failure; Newborn; Peritoneal dialysis; Neonatal nursing.

## O CUIDADO AO RECÉM-NASCIDO SUBMETIDO À DIÁLISE PERITONEAL: DESAFIOS PARA A EQUIPE DE ENFERMAGEM

**RESUMO:** Objetivou-se neste estudo caracterizar recém-nascidos que apresentaram Lesão Renal Aguda e necessitaram de diálise peritoneal em uma unidade de terapia intensiva neonatal do sul do Brasil no período de 2007 a 2010. Para tanto, realizou-se uma pesquisa descritiva do tipo estudo de caso, no primeiro semestre de 2012, a partir da busca de dados em prontuários, coletados por meio de um instrumento estruturado. Identificaram-se dez recém-nascidos com Lesão Renal Aguda; destes, dois foram submetidos à diálise peritoneal, pois eram prematuros extremos, porém apresentaram complicações e evoluíram a óbito. Conclui-se que conhecer os impasses no cuidado em diálise peritoneal leva à compreensão da necessidade de capacitação profissional e da educação continuada nos serviços de saúde neonatais.
**DESCRITORES:** Insuficiência renal; Recém-nascido; Diálise peritoneal; Enfermagem neonatal.

## EL CUIDADO AL RECIÉN NACIDO SOMETIDO A LA DIÁLISIS PERITONEAL: DESAFÍOS PARA EL EQUIPO DE ENFERMERÍA

**RESUMEN:** Se objetivó en este estudio caracterizar recién nacidos que presentaron Lesión Renal Aguda y necesitaron de diálisis peritoneal en una unidad de terapia intensiva neonatal del sur de Brasil en el periodo de 2007 a 2010. Para eso, fue realizada una investigación descriptiva del tipo estudio de caso, en el primer semestre de 2012, a partir de la búsqueda de datos en prontuarios, obtenidos por medio de un instrumento estructurado. Fueron identificados diez recién nacidos con Lesión Renal Aguda; de estos, dos fueron sometidos a la diálisis peritoneal, pues eran prematuros extremos, pero presentaron complicaciones y evolucionaron a óbito. Se concluye que conocer los obstáculos en el cuidado en diálisis peritoneal lleva a la comprensión de la necesidad de capacitación profesional y de la educación continuada en los servicios de salud neonatales.
**DESCRIPTORES:** Insuficiencia renal; Recién nacido; Diálisis peritoneal; Enfermería neonatal.

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## INTRODUCTION

Kidney failure is defined as the inability of the kidneys to excrete byproducts, leading to an increase in the concentration of urine and electrolytes. It can occur as a sudden deficiency of the kidney function in response to inadequate perfusion, kidney disease or obstruction of the urinary tract, causing an accumulation of toxins, Acute Renal Failure (ARF), now termed Acute Kidney Injury (AKI). The term AKI is broader as it encompasses both the small changes which occur in kidney function through to changes which require substitution therapy[1-5].

AKI occurs as a result of factors which suggest that the kidneys are incapable of regulating the volume and composition of the urine in the ingestion of the foods and liquids necessary for the organism. It is characterized by oliguria, associated with azotemia, which refers to the accumulation of nitrogen-containing products in the blood, metabolic acidosis and electrolyte disorders, such as alterations in the metabolism of potassium, hypernatremia, hypomagnesemia and hypophosphatemia, as well as hematuria, proteinuria, and raised serum urea and creatinine[1-2,4].

Among the therapies indicated in order to prolong the survival of the patient with AKI in the acute or chronic forms, peritoneal dialysis is considered an effective method; however, it is still associated with a considerable number of complications[6-7]. A significant percentage of children with AKI undergo dialytic methods, which include peritoneal dialysis. This, in its turn, refers to the administration of a solution of glucose and electrolytes directly into the peritoneal cavity through a silicone catheter known as a Tenckhoff Catheter. The peritoneal cavity possesses a semipermeable membrane which allows the exchange of solutes through osmosis and diffusion[1].

The mortality related to the neonatal period when there is a diagnosis of AKI is fairly significant, and can reach 25%[8]. In this regard, it is important to think that the care team – in particular the nursing team – must be prepared scientifically and technically to assist these children, always emphasizing the human measures in the care.

Emphasis is placed on the need for studies which viabilize the analysis of cases of AKI in newborns, contributing with epidemiological data for future investments and new technological and humanitarian discoveries in this process. The conceptions of the nursing team, as the caregiver regarding the assistance in peritoneal dialysis, can contribute in encouraging professional training, based on the difficulties linked to their work.

Nursing is a constantly evolving profession, which develops its knowledge in terms of concepts and theories, which support this professional practice and implement the work process which assists in decision-making, foreseeing facts and evaluating the consequences related to the treatment of the patients, including those patients who receive peritoneal dialysis and who require specific care[9].

This study's objective was to characterize the newborns with AKI who required peritoneal dialysis.

## METHOD

Research was undertaken with a case study, which is a research strategy in the area of health involving simple or complex cases, emphasizing the descriptive characteristics through an open but flexible plan, focused on a specific context. This type of study may be directed to a single or to multiple individuals(10); for the construction of this article, a case study of two newborns was used.

The data were collected in medical records in the archives department of a hospital institution in the municipality of Foz do Iguaçu, located in the west region of the State of Paraná, through a structured instrument containing the following variables: date of birth; Gestational Age (GA); maternal data; Apgar score; birth weight; the diagnosis behind the inpatient treatment; complications; peritoneal dialysis; fluid balance; medication; progression and complications. The period for data collection occurred in the first semester of 2012. This hospital institution was selected as it is considered a center of excellence in attending high-risk mothers and children.

As inclusion criteria for the search in the medical records, the researchers considered the medical records of children who received inpatient treatment in the Neonatal Intensive Care Unit (NICU) in the period 2007 – 2010 with a diagnosis of AKI and who received peritoneal dialysis. As an exclusion criteria, other newborns who did

not receive peritoneal dialysis were considered.

The study was firstly submitted to the Research Ethics Committee, and satisfied the norms of Resolution 196/96 of the Brazilian National Health Council and of Research involving human beings.

## RESULTS

The researchers analyzed 979 medical records of newborns who received inpatient treatment in the NICU between 2007 and 2010, the period in which 1,303 newborns received inpatient treatment in the NICU of the hospital institution investigated.

The access to the other 324 medical records was limited as a result of structural reform in the archives department at the time of data collection.

In the verification of the medical records, ten were found which indicated a diagnosis of AKI; however, only two met the study's inclusion criteria of being newborns with a diagnosis of AKI and who received peritoneal dialysis. The other individuals only received treatment with medications.

Table 1 describes the clinical characterization of the newborns, born in 2008.

Table 1 – Clinical and birth characterization of the newborns diagnosed with AKI who received peritoneal dialysis in the period 2007 – 2010. Foz do Iguaçu-PR, 2012

| Variables | Newborn A | Newborn B |
|---|---|---|
| Gestational age | 26 weeks | 29 weeks |
| Birthweight | 805 grams | 1,195 grams |
| Apgar in 1st minute | 4 | 5 |
| Apgar in 2nd minute | 7 | 8 |
| Sex | Male | Female |
| Type of birth | Cesarean | Cesarean |
| N. of birth | 2nd gestation | 4th gestation |
| Substances used by mother | Not described | Tobacco |
| Diagnosis of AKI | 20th day of life | 10th day of life |
| Signs and symptoms | Pallor, edema and anuria | Hypoactivity, pallor, edema, bradycardia, anuria |
| Start – diuretics | 6th day of life | 9th day of life |
| Start - antibiotics | Not described | 8th day of life |
| Blood transfusion | 19th day of life | 9th day of life |
| Beginning of peritoneal dialysis | 20th day of life | 13th day of life |
| Time of dialysis | 6 days | 11 days |
| Complications arising from dialysis | Extravasation in the insertion of the catheter | Perforation of the jejunal loop and sepsis |
| Progress in condition | Death | Death |

It may be observed in Table 1 that the newborns were extremely premature, with low birth weight, of both sexes, who were born through surgical birth, whose mothers had had multiple gestations, that one mother was a smoker and had a twin pregnancy. The Apgar score at the 1st minute in both cases was considered low; however, at the 5th minute, a certain recovery in the clinical status was presented. The diagnosis of AKI for the newborn weighing less than 1000 g occurred on the 10th day of life, while for the newborn weighing over 1000 g, the diagnosis of AKI occurred on the 20th day. Among the first signs and symptoms described, hypoactivity, skin pallor, edema, anuria and bradycardia are indicated.

In relation to the beginning of diuretic medication, it is ascertained that in the first case this was begun 14 days prior to the diagnosis of AKI, and in the second case, one day. For newborn B, it was necessary to make use of antibiotics; for newborn A, this was not described. It is observed that both needed blood transfusion, which occurred one day prior to the diagnosis of AKI.

The beginning of this dialytic method occurred for newborn A on the day on which the presence

of AKI was concluded, and for newborn B, only three days after the diagnosis. In both cases, there were complications with the techniques for inserting and maintaining the catheter for peritoneal dialysis, specifically, extravasation of liquid in inserting the catheter for the first case, and perforation of the intestinal loop, progressing to sepsis, in the second case. As a result of the complications presented, both newborns died.

## DISCUSSION

The limitations for the present study involved the difficulties of searching for medical records in the archives department of the hospital institution investigated, as this was being structurally reformed in the data collection period. In this context, it was not possible to undertake a search in all the medical records in the period studied. Another limitation inherent to this study relates to the scarcity of scientific articles referent to the issue, which, to a certain extent, restricted reflections regarding the results found.

The newborns investigated here were premature; the first was a neonate with extreme low weight and the second was a premature baby of very low weight. Taking these risk factors into account, it would be difficult to predict their progression, as these would depend on complex determinants for their survival, such as genetic, hormonal and environmental factors, added to the high neonatal morbidity related to the increase of energy expenditure and nutritional needs, common to extremely premature newborns[1-2].

It stands out that the newborn is more susceptible to AKI due to the volemic changes of the neonatal period, mainly in premature babies, as the functional maturation of the kidneys occurs after birth, when the kidneys become complete with approximately two million nephrons[11].

Another observation in relation to the recovery and progression of these neonates relates to the low Apgar score at the 1st minute. This scale represents an important instrument for the evaluation of the adverse conditions of the baby and of its vitality, determining the initiating of the care interventions(12). As a result, if the Apgar score is below seven in the 1st minute, a warning sign is ascertained, as this may present unfavorable conditions in relation to physiopathology and maturation, requiring additional professional care[13-14].

In the newborn, kidney failure may begin in the intra-uterine period, related to the presence of congenital diseases, such as renal dysplasia with or without obstructive uropathy, and in genetic diseases, such as autosomal recessive polycystic kidney disease. In the postnatal period, AKI is commonly acquired because of toxic insults and hypoxic-ischemic injury. This last is generally associated with aminoglucoside antibiotics and non-steroidal anti-inflammatory drugs, such as Indomethacin, used in the treatment of Patent Ductus Arteriosus (PDA), which is fairly common in premature babies. It is noted that in this situation, AKI is generally reversible[15].

Many kidney injuries occur in a secondary form to problems during birth, such as, for example, renal cortical necrosis. This type of injury is associated with hypoxia or ischemia related to perinatal anoxia, placental abruption and fetofetal transfusion with consequent activation of the coagulation cascade, whose origin is multifactorial[1,5,7].

Although its exact incidence and prevalence are unknown, studies have demonstrated that AKI is common in NICU[1,7]. The literature indicates that changes in renal function occur frequently in premature newborns (31.1%), in particular when associated with cardiac surgery, due to the need for extracorporeal circulation and to the association with sepsis, reaching 30% and 22%, respectively[7-8,16].

In caring for premature newborns with low or very low weight, the nursing team must be able to recognize the signs and symptoms of the presence of AKI, namely: anuria or oliguria (diuresis below 0.5 to 1 ml/kg/h in 24 hours), pallor, edema, poor peripheral perfusion and hypertension, among others. In these situations, the specific and intensive care of the nursing team regarding the fluid balance and the rigorous observation of the newborns are intensified[1-4,7].

Following diagnosis of AKI, it is necessary to initiate diuretic medications, and should a negative response be obtained to the pharmacological treatment, it is necessary to opt for the indication of peritoneal dialysis. This, in its turn, has as its purpose the replacment of renal function, removing endogenous metabolites, exogenous toxins and excess fluid. For this, a semipermeable peritoneal membrane is used, whose process allows the passive transference of water, electrolytes

and toxins, these being transferred from the capillaries of the peritoneum to the dialysis fluid through a drain[17]. Peritoneal dialysis is a relevant mode of therapy for AKI in the newborn when vascular access is difficult to maintain. However, prognosis and recovery are highly dependent on the underlying etiology of the AKI[1,7].

The exact incidence of this pathology is unknown, although rates are mentioned of 3% to 8% in newborns receiving inpatient treatment in intensive care units. There is little information on the prognosis of children with AKI who receive peritoneal dialysis in the first month of life, with mortality being considered fairly high (mean of 25 to 50%)[17]. The literature also indicates that the mortality rates related to the neonatal period with a diagnosis of AKI are significant, as in one sample of 45 children in the neonatal period, 23 received methods of dialysis, of whom 73.9% later died[18].

The factors associated with mortality include multiple organ failure, hypotension, a need for vasoconstrictors, hemodynamic instability and the need for mechanical ventilation and dialysis. The mortality and morbidity of the newborns with AKI are much worse in newborns when associated with multiple organ insufficiency[1].

Other newborns need monitoring and treatment throughout their lives, as they may progress to Chronic Kidney Injury (CKI)[5], as it is necessary to observe and monitor their renal function, blood pressure and urine tests. Typically, the late development of CKI becomes apparent with the development of hypertension, proteinuria, and, eventually, with the alteration of the urea in the blood and raised creatinine[1,5].

The complications in using peritoneal dialysis range from mechanical problems (abdominal and thoracic pain, bleeding, extravasation, inadequate flow, perforation of viscera, obstruction of the catheter), infection-related problems (peritonitis), and clinical problems (hypervolemia, hypovolemia, hyperglycemia and protein loss, among others)[12]. However, difficulties and complications of peritoneal dialysis are not barriers to the treatment, as this has been shown to be effective in the cases of premature babies with very low weight who progress to AKI. One must highlight, however, that in spite of offering supplementary nutrition, the majority of children receiving dialysis in the long term have impaired growth and mild developmental abnormalities[4-5,19].

It stands out that peritoneal dialysis is an efficacious form of substitutive renal therapy in the neonatal period; however, this population's morbidity and mortality, unfortunately, remain high[8].

Given the importance of the early diagnosis and treatment of AKI, the existence is indicated of great interest in investigating other markers of kidney injury and function, which make it possible to detect the cellular injury prior to the reduction in kidney function, distinguish causes and predict progression. Among the most promising are serum cystatin C, urinary Interleukin-18 (IL-18), serum and urinary Kidney Injury Molecule-1 (KIM-1), N-acetil-beta-D-glucosaminidase, and serum and urinary neutrophil and gelatinase-associated lipocalin (NGAL)[20].

Due to the presence of complications during the procedure and maintenance of peritoneal dialysis, it is necessary to effectively prepare the entire nursing team. The presence of a trained multi-professional team and of modern equipment such as incubators, respirators and cardiac and oxygen monitors, among many others, is mandatory in the NICU environment, in order to ensure the best assistance for the neonate, among other specific requirements[17].

The nursing care for these complex patients requires the professionals to have specific theoretical-practical knowledge which enables them to attend the patients safely, preventing the incidence of adverse events and of undesirable consequences in the course of the treatment[21].

In this regard, continuous education is presented as an ongoing process whose purpose is to update and improve professional capacity in relation to the social difficulties and to technical and scientific advances. Therefore, the integration of the trained nurse is necessary in order to plan and organize the work in accordance with previously established and documented norms, so as to regulate the hospital services required[22-23]. Furthermore, the professional's experience in the routine work certainly results in the acquisition of new competencies in order to achieve the magnitude of her work process[24].

**FINAL CONSIDERATIONS**

In the period 2007 – 2010, in the hospital institution investigated, 10 newborns progressed to AKI, and only two received peritoneal dialysis.

Emphasis is placed, however, on the possible loss in the sample as a result of the limitations for undertaking this study.

The newborns identified for this study were born extreme prematurely, of both sexes, born through surgical births. They had complications in using peritoneal dialysis: extravasation of liquids in the insertion of the catheter, and peritonitis. The signs and symptoms of AKI presented were anuria, edema, hypoactivity, skin pallor and bradycardia. Both of the newborns died.

This study's results demonstrate that knowing the obstacles and the limitations for care in peritoneal dialysis directs the professionals to understanding the importance of professional training and continuous education in the health services, in particular in the area of neonatology.

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