



# Incidence of urinary infection among kidney-transplant recipients

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**ABSTRACT.** Urinary tract infection is the most common bacterial complication in renal transplant. This study investigated the number of urinary infection in renal transplant patients at a transplant center aimed at improving nursing care in order to minimize the incidence of urinary infection. We analyzed 59 medical records of patients subjected to renal transplant from May to June 2015 at a transplant center in a hospital in northwestern state of Paraná. The prevailing age of the patients was between 50 and 60 years (29%), and the hemodialysis time was up to 24 months (30%). In patients diagnosed with urinary tract infection (36%), the prevalent microorganisms were: *Enterobacter cloacae* (25%), occurring more frequently in the first month after transplantation (67%). It was concluded the nursing team may act in the control and prevention of urinary tract infection.

**Keywords:** chronic kidney disease, transplant, urinary tract infection, bladder catheterization delay, nursing care.

## Incidência de casos de infecção urinária em receptores pós-transplante renal

**RESUMO.** A infecção do trato urinário é a intercorrência bacteriana mais comum em transplante renal. O presente trabalho objetivou investigar o número de infecções urinárias em pacientes transplantados renais em um centro transplantador, visando à melhoria dos cuidados de enfermagem a fim de amenizar a incidência de infecção urinária. Analisou-se 59 prontuários de pacientes que foram submetidos ao transplante renal entre janeiro 2012 à janeiro 2015 em um centro transplantador situado em um hospital no Noroeste do estado do Paraná. A idade prevalente dos pacientes foi entre 50 e 60 anos (29%), e o tempo de hemodiálise foi de até 24 meses (30%). Entre os pacientes diagnosticados com infecção urinária (36%) o microorganismo prevalente foi: *Enterobacter cloacae* (25%), ocorrendo com maior frequência no primeiro mês após o transplante (67%). Conclui-se que a equipe de enfermagem pode atuar satisfatoriamente no controle e prevenção da infecção urinária.

**Palavras-chave:** doença renal crônica, transplante, infecção do trato urinário, cateterismo vesical de demora, cuidados de enfermagem.

## Introduction

Chronic kidney disease (CKD) consists of kidney damage and progressive and irreversible loss of renal function. It is defined by the inability of the kidneys to maintain the normality of the internal environment, thus, depending on one of the modalities of substitutive therapy (Medeiros & Sá, 2011).

CKD imposes restrictions and limitations on patients, especially after the initiation of dialysis, so that people may become incapable of developing daily activities, and the assistance of third parties (family members, nursing staff) is necessary (Oller et al., 2012).

According to the Brazilian Guidelines for Chronic Kidney Disease, risk factors for the development of CKD are divided into high risk for patients with systemic arterial hypertension, diabetes mellitus and family history of chronic kidney disease. On the other hand, patients of average risk

are the elderly, patients with systemic diseases, recurrent urinary infections, recurrent urinary lithiasis and uropathy (Xavier, Santos, Almeida, Clos, & Santos, 2014)

Renal replacement therapy modalities, termed renal replacement therapies, include hemodialysis, peritoneal dialysis, and renal transplantation. These alternatives employ advanced technologies, involving the accompaniment of specialized health professionals and high costs. The last alternative for the CKD patient who did not succeed with dialysis treatment is renal transplantation, with deceased or living donor. Xavier et al. (2014)

Renal transplantation is defined by the Manual of the State Transplant Center (CET) as a treatment option for patients suffering from advanced chronic kidney disease, thus, a healthy kidney of a living or deceased person is donated to a patient with advanced chronic renal failure, who receives it through a surgical procedure (Central

Estadual de Transplantes do Paraná [CET-PR], 2014).

For a successful transplantation, it is recommended to follow the Manual of the State Transplant Center (CET) to guide transplant activities in the State of Paraná (Silva, Pontes, Genzini, Prado, & Amaral, 2014)

After the initiation of dialysis within a period of ninety days, the dialysis units must introduce to the eligible patient, or legal representative, the option of enrolling in a renal transplant team (Associação Brasileira de Transplante de Órgãos [ABTO], 2014).

The distribution of kidneys is performed for patients enrolled in the Unique Technical Registry (CTU), so that only those who have active status participate in the selection. Patients are selected automatically by computer program, without any possibility of interference from operators. The distribution, under the responsibility of CET-PR, obeys criteria set forth by the Ministry of Health that take into account the compatibility between the donor and recipient by the ABO system, tissue compatibility by HLA antigens, age and time registered on the waiting list. Priority is also given for cases of imminent impossibility of any dialytic modality (Silva et al., 2014).

Transplantation can occur through a living or deceased donor. The living donor is a legally capable citizen who, under the law, can donate organ or tissue without compromising his/her health and vital skills. The donor must be in good health conditions and must carry out examinations to detect diseases that could compromise his/her health during or after donation. By law, relatives up to the fourth degree and spouses can be donors, not relatives, only with judicial authorization (Sousa, Galante, Barbosa, & Pestana, 2010)

Transplantation with a deceased donor occurs only with a donor diagnosed with brain death, defined by the definitive and irreversible cessation of all brain functions. For the brain-dead donor, there is a routine and a national protocol that are strictly followed by recruitment teams where all potential deceased organ donors should be subjected to the following minimum procedures required by ordinance 2,600 of October 21<sup>st</sup>, 2009.

The major steps are:

- Checking brain death and obtain authorization from the family;
- Eliminating any disease that prevents transplantation (serum positive for HIV, serum positive for HTLV I and II, active tuberculosis, serious or potentially serious viral or fungal infections in the presence of immunosuppression,

except for hepatitis B and C, neoplasms (except for some primary tumors of the central nervous system (CNS) and in situ carcinoma of the uterus and skin), refractory sepsis;

- Recognizing the viability of the organ to be donated;

- Performing the compatibility tests:

- 1- Blood typing: to check the compatibility of donor and recipient blood types;

- 2- Typing (HLA analysis): examination performed on leukocytes, which identifies the compatibility between individuals, receiving an organ from a person with similar characteristics can increase the success of the transplant;

- 3- Lymphocyte cross-match test: it reveals whether the recipient patient has antibodies directed against the donor's antigens and whether he/she will reject the organ.

- Maintenance of the potential donor, it is one of the phases of the donation process that has a direct and proportional relationship to the final outcome of the procedure.

- Finding the most suitable recipient;

- Sending the organ to the site of surgery of the recipient (Silva et al., 2014)

This kidney is implanted in the patient and begins to exert the functions of filtration and elimination of liquids and toxins, and is considered the most complete alternative of replacement of the renal function, thus offering a better quality of life, since it, guarantees more freedom in the daily routine of the patient (Oliveira et al., 2012)

The number of renal transplants (Tx) in Brazil has been increasing over the years, the total number of kidney Tx in the period from 2007 to 2014 was 47,848, of which 62% were from deceased donors, 31% related living donors and 7% unrelated living donors.

In the state of Paraná, from 2007 to 2014, according to the Brazilian Association of Organ Transplantation (ABTO), 2,891 kidney transplants were performed, of which 1,509 were related living donors and 1,382 were deceased donors (Costa & Nogueira, 2014).

A Brazilian study showed that 821 renal transplant patients presented infectious complications. The most prevalent were: urinary tract infections (ITU) (31.3%), cytomegalovirus infections (CMV) (12%), surgical site infections (10.3%), herpes virus infections (9.1%), respiratory tract infections (RTI) (5.2%) and bloodstream infections (ICS) (4.3%). Cold ischemia time and the use of kidneys from deceased donors were considerable risk factors for the occurrence of these infectious episodes (Correa et al., 2013).

Urinary tract infection (ITU) is the most common bacterial infection in renal transplantation, with a variable incidence of 6-86% of the recipients. Such variable incidence can be attributed to differences in the definition of ITU, being by method of collection of urine and use or not of antibiotic prophylaxis in the postoperative period. Therefore, ITU is more common in the early postoperative period (three to six months post-Tx) and has a direct effect on recipient morbidity and mortality (Roque, Melo, & Tonini, 2007).

The most common complications related to ITU after renal Tx are: sepsis (occurring in 40 to 60% transplanted patients); reinfection (usually occurs by a pathogen different from that of the previous infection) and chronic rejection (whose risk increases after three years of transplantation) and cytomegalovirus infection (which is very common after a febrile ITU episode) (Correa et al., 2013).

In this way, since the ITU in post-renal Tx directly contributes to the individual morbidity and mortality, this study aimed to investigate the incidence of ITU in renal transplant patients at a reference hospital in northwestern state of Paraná.

### Material and methods

This is a quantitative, descriptive, observational, retrospective study using a probabilistic sampling technique. Data were collected through analysis of 59 medical records of patients who had undergone renal transplantation from January 2012 to January 2015 at the hemodialysis ward of a transplant center located in a hospital in northwestern state of Paraná, aiming to investigate the incidence of ITU in patients after renal transplantation.

The present study was submitted to the research ethics committee of Faculdade Ingá and approved by opinion 045886/2015. After, data collection was started by documentary analysis of the medical records of patients submitted to renal transplantation between 2012 and 2015, data were collected through a consultation in the hospital database. Data were analyzed using Microsoft Office Excel 2007, with an instrument developed by the researcher, analyzing sex, age, hemodialysis time, type of donor, index of infections after renal transplantation and date of development /diagnosis of ITU.

The institution studied presents a protocol for care of patients after renal transplantation. Descriptive statistical analyses were performed using the software Microsoft Office Excel 2010.

### Results and discussion

Urinary Tract Infection (ITU) corresponds to the growth and proliferation of bacteria inside the urinary tract causing lesions of varying degrees, and represents one of the main types of hospital infection. Frequently, bacteria can reach any level of the urinary tract, from the bladder, causing cystitis, urethritis and pyelonephritis (Jorge & Vidal, 2014).

Urinary tract infections are a frequent cause of morbidity and, in certain situations, can lead to significant mortality. The diagnosis is always done on a clinical and laboratory basis.

In the sample of 59 patients, 61% were males, the average age was: between 50 and 60 years, 29%, from 10 to 20 years, 7%, 20-30 years; 40-50 years; 60-70 years with 15%, 30-40 years and 70-80 years, 14 and 5%, respectively.

The predominance of male transplanted patients is consistent with studies that indicate a higher prevalence of renal transplantation in men (Jorge & Vidal, 2014).

Regarding the demographic data, the age group found in the present study was similar to the studies conducted in Teresina, state of Piauí, in 2010, in which, among the 147 patients transplanted, 38.1% of them were between 41-60 years old (Magalhães et al., 2014).

In relation to the time in renal replacement therapy up to the renal transplant, the average time was up to 24 months (30%); 24 to 48 months (27%), 48 to 72 months (12%), over 72 months (14%) and patients who did not had the date recorded in the files or who came from other institutions (17%).

The results related to the time in hemodialysis until renal transplantation indicates different results, where 51% of patients showed an average of 8-70 months until transplantation in a study conducted by Magalhães et al. (2014) in Teresina, state of Piauí.

Regarding the type of donor, 59% of the transplants performed from 2012 to 2015 were with related living donors and 41% with deceased donors; 36% of renal transplant recipients acquired urinary tract infection, and 8% of the 59 patients studied showed loss of renal graft.

Considering the type of donor, the subjects were mostly recipients of living donors, this result is similar to the data found in another study conducted in the state of Paraná, from 2007 to 2014, where among 10,854 solid organ transplants, 2,891 were renal grafts. Of these, 1,509 were from living donors and 1,382 from deceased donors (Sousa et al., 2010).

With respect to graft loss, our result corroborates another study conducted in Porto Alegre, state of Rio Grande do Sul, from 2007 to 2009, where 179 transplanted patients were analyzed and, among them, 121 (67.6%) had complications, including graft rejection in 8 patients (3.8%).

It is worth emphasizing that it is still necessary to stimulate educational campaigns for the population regarding organ donation, also with regard to the living donor, in order to contribute to increase the number of donations among first degree relatives, thus reducing the time on the waiting list for a renal transplant and the time in hemodialysis.

The predominant underlying disease among the analyzed patients was glomerulonephritis (32%), arterial hypertension (27%), polycystic kidney (11%), diabetes mellitus (8%), other (diabetes mellitus/arterial hypertension, undetermined, lupus, urinary tract infection, nephritis, nephrocalcinosis, nephrolithiasis, vesicourethral reflux) with 22%.

The sample used in the study, despite being from a single transplant center, is representative of the profile of patients in renal replacement therapy, where the data are in accordance with a study conducted in Rio de Janeiro, state of Rio de Janeiro, in 2013, where among the most frequent causes of IRC, stand out arterial hypertension (24%), Glomerulonephritis (24%) and *Diabetes mellitus* (17%) (Correa et al., 2013).

Our results in relation to renal transplant complications were in line with studies carried out in a large hospital in Southern Brazil. Of the 179 patients analyzed, 29.2% acquired urinary tract infection, 32.1% of them presented rejection (Magalhães et al., 2014).

Table 1 lists variables related to the microorganism, results divergent from the present study, where a sample with 588 episodes of urinary tract infection, the etiology was attributed to *Escherichia coli* in 37% of cases, *Enterobacter* sp in 19%, *Klebsiella pneumoniae* in 11%, *Pseudomonas aeruginosa* in 6% and other etiologies in 27%.

**Table 1.** Distribution of microorganisms related to urinary tract infection in renal transplant patients at a large transplant center. Maringá, state of Paraná, 2015

Microorganism	Frequency (n = 38)	Percentage (%)
<i>Enterobacter cloacae</i>	10	25
<i>Klebsiella pneumoniae</i>	9	22
<i>Escherichia coli</i>	9	22
<i>Staphylococcus coagulase</i>	2	7
<i>Pseudomonas aeruginosa</i>	2	6
<i>Citrobacter spp</i>	2	6
Others <sup>(1)</sup>	4	12

\*<sup>(1)</sup>*Streptococcus agalactiae*, *Candida tropicalis*, *Enterococcus faecalis*, *Staphylococcus aureus*.

The time to diagnosis of the first episode of ITU after renal Tx was less than 30 days in 87% of the cases, between 30 and 90 days for 10.5% cases and more than 90 days in 2.3% (Oliveira et al., 2012).

Table 2 reinforces the information and research already published, in relation to the results obtained on the incidence of ITU after renal Tx, showing that ITU is more frequent in the first month post-transplantation

**Table 2.** Time of clinical confirmation by laboratory examination in renal transplant patients at a large transplant center. Maringá, state of Paraná, 2015.

Time (in months)	Frequency (n = 21)	Percentage (%)
Less than 1	15	67
2	2	11
3-12	2	11
More than 12	2	11

Several risk factors related to infectious complications are present after renal transplantation, highlighting the need for permanent immunosuppression. The dose of immunosuppression used is directly related to the incidence and severity of the infectious events after renal transplantation.

Urinary tract infection is a clinical problem, where 80% of cases are associated with the use of bladder indwelling catheter (Magalhães et al., 2014).

As for the incidence of infections related to the urinary tract, approximately 40% of all nosocomial infections are related to bladder catheterization and 5 to 10% after surgical procedures with urinary tract manipulation (Jorge & Vidal, 2015).

Besides that, there are diverse factors that make urinary catheterization a terrible means for the development of ITU, mainly the presence of the catheter in the urethra, which removes the intrinsic defense mechanisms of the host, and the catheter retention balloon, which prevents the complete emptying of the bladder and may cause the microorganisms to spread (Conselho Federal de Enfermagem [Cofen], 2013).

The National Health Surveillance Agency (Agência Nacional de Vigilância Sanitária [ANVISA], 2013) establishes as basic practice regarding the use of bladder indwelling catheter in patients regardless of its pathology, preventive measures for ITU, among which are: the infrastructure for prevention, in which it must be created and implanted written protocols for use, insertion and maintenance of the catheter; developing and implementing criteria for indications

for the use of urinary catheters; the indications for use of urinary catheter are limited, as follows: perioperative period for selected procedures, monitoring of urinary output in critical patients, management of acute urinary retention and obstruction.

It is necessary to ensure that the insertion of the urinary catheter is performed only by trained and skilled professionals, providing materials for insertion with aseptic technique. And also, implementing documentation system in medical records of the following information: indications of the catheter, professional responsible for the insertion, date and time of insertion and removal of the catheter.

In addition to the implementation of preventive measures, it should also carry out the process monitoring, grouping patients or units, according to the risk, to establish the routine of monitoring and surveillance, considering the frequency of catheter use and the potential risks. Importantly, permanent education has the goal of reducing the incidence of ITU by means of training the health staff involved in the insertion, care and maintenance of the urinary catheter in relation to the prevention of ITU, including alternatives to catheter use and procedures for insertion, handling and removal (Agência Nacional de Vigilância Sanitária [ANVISA], 2013).

## Conclusion

Urinary tract infection (ITU) is an important factor to consider about the kidney transplanted patient. It should not be forgotten that in addition to postoperative complications, ITU still could be one of the causes of organ failure regardless of the type of donor.

Urinary tract infections in these patients are more frequently caused by bacteria of the family Enterobacteriaceae, especially *Enterobacter cloacae* found in human feces, which are opportunistic pathogens. In the present study, of the 59 medical records analyzed, 21 patients were diagnosed with urinary tract infection. This type of microorganism can be removed by washing hands with soap and water before and after contact with the patient.

Our findings indicate the need to extend the active surveillance of ITU after renal transplantation, as well as to implement strategies to prevent and control these complications. It can be identified that nursing actions permeate all possible

preventive actions for the control and prevention of infection associated with bladder catheterization. Still, considering the complications of this procedure, the importance of permanent education according to the safety practices recommended in scientific studies is emphasized. With respect to limitations of the study, it was carried out in only one transplant center, and further studies should be conducted for a greater generalization of the results found here.

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