



# The Process of Kidney Donation in the Northern Macroregional Area of Paraná, Brazil

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## ABSTRACT

**Introduction.** The high morbidity and mortality caused by chronic kidney disease, and consequently, the increase in the need for kidney transplants, makes the evaluation of the kidney donation process relevant to verifying the service's fragility with the goal of optimizing this process.

**Objective.** This study analyzed the process of kidney donation in the Northern Macroregional area of Paraná, Brazil.

**Method.** This was a cross-sectional and retrospective evaluation study based on 586 reports of deaths provided by the Intra-Hospital Organ Donation and Transplant Tissue Commissions to the Organ Procurement Organization of the Northern Macroregional area of Paraná in Brazil between 2011 and 2015. Data were analyzed by descriptive statistics, prevalence ratio, and Poisson regression.

**Results.** The prevalence of kidney donation was higher among the deaths of individuals younger than 61 years of age ( $P = .018$ ) due to traumatic brain injury and hemorrhagic cardiovascular accident ( $P < .001$ ), assisted in private institutions ( $P = .037$ ), and occurring in the second half of the year ( $P = .015$ ).

**Conclusion.** The process of kidney donation was mainly compromised due to the refusal of the family and was associated with clinical and organizational aspects.

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**C**HRONIC kidney disease is a worldwide public health problem due to its high morbidity and mortality, high social and economic costs, and growing incidence of cases. Kidney transplantation is an important therapeutic option for affected individuals via increasing life expectancy and improving quality of life. For these reasons, a large number of people are waiting for this treatment, which has resulted in an increased demand for organs [1,2].

Brazil has the largest public organ and tissue transplantation program in the world, and occupies second place in the world ranking in absolute numbers of these surgeries. The effective kidney donor rate in 2016 was 25.9 per million population (pmp); this rate was 43.7 pmp in the state of Paraná, third in the national ranking. Although these results are encouraging, and Southern and Southeastern states are the most efficient in organ harvesting and transplantation when compared with other Brazilian regions, the discrepancy between kidney

demand and supply causes an increase in waiting time, and consequently, the potential worsening of kidney disease for those in line, mainly as the result of a lack in kidney donation. There were 19,700 patients on the waiting list for kidney transplantation in June 2016; of these, 1151 were residents in the state of Paraná [3,4].

Spain is the world reference in organ donation. It attributes its good results to the organization of the national transplant system, especially after the implementation of the Quality Assurance Program, which promotes evaluation of

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the donation process in 2 stages: by hospital self-evaluation, and evaluation by an external professional coordination following the performance through the transformation of data obtained in indicators [5].

In Brazil, there is no quality program for the donation process and transplantation of organs that can determine the causes of losses, such as underreporting, donor maintenance, and family refusal as a result of lack of assistance; studies evaluating this matter are scarce [6]. Thus, it is important to analyze the results of the kidney donation process when considering the large number of individuals waiting for this organ in this country, as well as the high costs related to treatment of chronic kidney diseases. Therefore, this study analyzed the kidney donation process in the Northern Macroregional area of Paraná in Brazil and examined the strengths and weaknesses of this service to subsidize planning actions to improve the process and to guide policies of permanent education for health professionals and society.

## METHODS

This was a cross-sectional and retrospective evaluation study carried out in the Northern Macroregional area of Paraná, comprising 22 health centers and 97 municipalities. Of these, only 16 hospitals in 10 municipalities are accredited with the Organ Procurement Organization (OPO), of which 3 are public, 12 are philanthropic, and 1 is private, all providing health care at medium and high complexity levels.

Between 2011 and 2015, the Organ Donation and Transplant Tissue Commissions (IHODTTC) sent 586 reports of notifications of potential donors in brain death (BD) to the OPO of the Northern Macroregional area of Paraná. These reports represent the data source of this study.

The adopted inclusion criteria were reports of donors eligible due to BD, within the age range for kidney donation between 7 days of life and 75 years old, and without clinical contraindications (positive serology for HIV, positive serology for T lymphotropic virus- HTLV, sepsis, neoplasia, renal failure, transoperative findings that make donation impossible, hemodilution, having tattoos/piercing performed in the last 12 months before donation, and being an ex-convict in the last 12 months before donation). Protocol notifications with reports of inconclusive BD were excluded.

The variables considered in this study were: notification year (2011, 2012, 2013, 2014, and 2015), notification semester (1st and 2nd semester), type of notifying center (public, philanthropic, and private), age (in years), sex (female and male), cause of death (traumatic brain injury [TBI], hemorrhagic cardiovascular accident [HCA], and others not specified), family consent to initiate the donation protocol (yes and no), reasons of nondonation (family refusal and logistic-structural problems), effective kidney donor (yes and no), and outcome of kidney collection (discharge and transplantation).

The data were analyzed in the software *Statistical Package for Social Sciences* version 20.0 by descriptive statistics using absolute and relative frequencies for categorical variables and median and interquartile range for numerical variables when these did not adhere to the normal distribution by the Shapiro-Wilk test. Poisson regression was performed with prevalence ratio calculation and respective 95% confidence intervals. All independent variables that presented  $P < .20$  in the bivariate association were added in the regression

considering kidney donation as a dependent variable. The independent variables that best explained the donation process remained in the final model. Statistical significance was set at  $P < .05$ . The study was conducted in accordance with national and international guidelines on research ethics involving human subjects, and was approved by the Research Ethics Committee of the Londrina State University according to Protocol number 1395.408.

## RESULTS

A flowchart of the process of kidney donation for transplantation is shown in Fig 1. Of the analyzed 586 reports of deaths by BD, 393 (67.1%) were potential donors that fit the criteria of eligible kidney donors.

The profile characterization of the 393 eligible donors showed that the age ranged from 5 to 79 years, with a median of  $49 \pm 27$  years, and 62% were male. The distribution of the year of notification was: 16.3% ( $n = 64$ ) in 2011, 24.7% ( $n = 97$ ) in 2012, 19.1% ( $n = 75$ ) in 2013, 8.4% ( $n = 33$ ) in 2014, and 31.6% ( $n = 124$ ) in 2015. It was identified that the underlying cause of brain death was hemorrhagic HCA occurring in 42.5% ( $n = 167$ ), ischemic HCA in 10.9% ( $n = 43$ ), TBI in 33.8% ( $n = 133$ ), and causes not specified in the analyzed database in 12.7% ( $n = 50$ ).

The profiles of the 145 effective kidney donors showed a median age of  $49 \pm 29$  years and variation from 6 to 74 years. The donations from male subjects accounted for 38.4% ( $n = 94$ ) and from female subjects for 34.5% ( $n = 51$ ). The distribution of blood types was: type O (45.5%,  $n = 66$ ), followed by type A (35.9%,  $n = 52$ ), type B (14.5%,  $n = 21$ ), and type AB (4.1%,  $n = 6$ ). The effectiveness of the donation process increased from 25% in 2011 to 38.7% in 2015 ( $P < .001$ ).

The results of the association between renal donation and clinical and organizational variables are presented in Table 1. The prevalence of kidney donation was 0.819 times lower after 61 years of age in the studied population. The type of death was 2.656 times greater by TBI and HCA compared with other causes. The proportion of renal donation was 0.601 times lower among public/philanthropic compared with private institutions. The proportion of kidney donations was higher in the second half of the year.

## DISCUSSION

Organ donation is a complex process that depends on the following steps: identification of patients with clinical criteria for BD, diagnosis of BD, clinical-laboratory evaluation, maintenance of the potential donor, family interview, and organ collection [7]. The greatest fragilities in these stages were family refusal, logistical-structural problems, and the evolution from BD to cardiorespiratory arrest before organ collection, which may indicate inadequate maintenance of the body.

Of the 586 deaths by BD, 32.9% presented clinical contraindications for donation, of which the majority was caused by sepsis (13.5%), which represents one of the main causes preventing progress in the donation protocol. The

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