THE SYSTEMATIZATION OF NURSING CARE AS A DECISIVE FACTOR IN INCREASING THE EFFECTIVENESS OF ORGAN DONATIONS IN BRAZIL: A MULTIVARIATE ANALYSIS

SISTEMATIZAÇÃO DO CUIDADO DE ENFERMAGEM COMO FATOR DECISIVO PARA O AUMENTO DA EFETIVAÇÃO DE DOAÇÕES DE ÓRGÃOS NO BRASIL: UMA ANÁLISE MULTIVARIADA

LA SISTEMATIZACIÓN DEL CUIDADO DE ENFERMERÍA COMO FACTOR DECISIVO PARA EL AUMENTO DE LA EFECTIVIDAD DE LAS DONACIONES DE ÓRGANOS EN BRASIL: UN ANÁLISIS MULTIVARIADO

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ABSTRACT

Organ donation public scarcity remains a global public health challenge, requiring well-founded strategies tailored to the clinical context of potential donors. This study aims to analyze the influence of the Nursing Process on organ donation effectiveness in Brazil between 2001 and 2023. A quantitative, retrospective approach was adopted using secondary data from the National Transplant System. Econometric analysis, including correlation, multivariate regression, and principal component analysis, was employed to explore the relationships between nursing care and donation outcomes. Results show a statistically significant correlation between structured nursing care and increased donation rates, rejecting the null hypothesis, thus attesting to the real prominence of the nursing professional in patient care. The study contributes to theoretical development by proposing an integrative care model and to practice by reinforcing the strategic role of qualified nursing teams in the management of brain-dead patients.

Keywords: Nursing Process. Organ Donation. Critical Patient. Brain Death. Nursing Care.

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RESUMO

Os órgãos humanos para transplante legal são escassos e configura um desafio mundial de saúde pública, demandando estratégias assistenciais fundamentadas e sensíveis ao contexto clínico do potencial doador. Esta pesquisa tem o objetivo de analisar a influência do processo de enfermagem na efetivação da doação de órgãos no Brasil entre os anos de 2001 e 2023. Utilizou-se uma abordagem quantitativa, de natureza retrospectiva, com dados secundários extraídos do Sistema Nacional de Transplantes. A análise estatística empregou testes econométricos de correlação e regressão para examinar a relação entre a atuação da equipe de enfermagem e os índices de efetivação. Os resultados apontam correlação significativa entre a sistematização do cuidado e o aumento da efetivação de doações, rejeitando-se a hipótese nula, atestando assim a real prominência do profissional da enfermagem no cuidado ao paciente. A contribuição deste estudo reside na construção de um modelo assistencial que articula fundamentos teóricos da Enfermagem e evidências empíricas robustas, reforçando a importância da atuação qualificada dos profissionais de saúde diante do paciente crítico em morte encefálica.

Palavras-chave: Processo de Enfermagem. Doação de Órgãos. Paciente Crítico. Morte Encefálica. Assistência de Enfermagem.

RESUMEN

La escasez de órganos para transplante publicos sigue siendo un desafío de salud pública global que requiere estrategias fundamentadas y adaptadas al contexto clínico del donante potencial. Este estudio tiene como objetivo analizar la influencia del Proceso de Enfermería en la efectividad de la donación de órganos en Brasil entre 2001 y 2023. Se adoptó un enfoque cuantitativo, retrospectivo, utilizando datos secundarios del Sistema Nacional de Trasplantes. Se aplicaron análisis econométricos, incluyendo correlación, regresión multivariada y análisis de componentes principales, para investigar las relaciones entre el cuidado de enfermería y los resultados de la donación. Los resultados muestran una correlación estadísticamente significativa entre el cuidado estructurado y el aumento en las tasas de donación, rechazando la hipótesis nula, Atestiguando así el protagonismo real del profesional de enfermería en la atención al paciente. El estudio aporta al desarrollo teórico al proponer un modelo de atención integradora y, en la práctica, refuerza el papel estratégico del equipo de enfermería calificado en la gestión del paciente con muerte encefálica.

Palabras clave: Proceso de enfermeira. Donación de órganos. Paciente crítico. Muerte cerebral. Atención de enfermeira.

INTRODUCTION

Organ donation is a topic that encompasses ethical, social, and technical-scientific

dimensions. In Brazil, the national transplant policy has advanced in recent decades, but it still faces significant obstacles, especially those related to the identification, maintenance, and realization of potential donors. At the center of this process is the nursing team, whose role in caring for critically ill patients with brain death is crucial to the success of organ procurement.

The Systematization of Nursing Care (SAE) is a consolidated strategy in clinical practice and has been incorporated into intensive care units (ICUs) as a guiding tool for care. The standardization of actions, combined with clinical decision-making capacity, enhances the preservation of viable organs and ensures compliance with legal and bioethical protocols. Given this, it is imperative to understand how this tool influences national indicators of donation effectiveness. Among the main challenges faced is the high rate of family refusal, often resulting from inadequate communication or gaps in staff preparation. In addition, the absence of specific nursing protocols for this patient profile compromises the effective conduct of the process.

Manzari et al (2021) suggest that structured interventions and continuous training of professionals have a positive impact on families' adherence to donation. Therefore, it is necessary to overcome the fragmented approach focused solely on medical aspects, adopting a broader view of care that includes the clinical, emotional, and organizational management of the process. Critical nursing, when working in an integrated manner with the multidisciplinary team, proves to be a catalyst for the effectiveness of organ transplantation (FORSBERG et al., 2020).

The complexity that permeates the organ donation process in Brazil highlights weaknesses in care practices aimed at potential donors, especially with regard to the systematization of care provided by nursing teams. In this scenario, the absence of standardized and evidence-based practice in the context of intensive care is identified as a central problem, which compromises the effectiveness of donations. Given this gap, the present study aims to analyze the impact of the SAE on the effectiveness of converting potential donors into actual donors, based on national indicators. This investigation is justified by the clinical, ethical, and organizational relevance of the topic, considering that systematic care for brain-dead patients can make a difference in the quality of decision-making, the reduction of avoidable losses, and the strengthening of interdisciplinary practices in health services. It is, therefore, a proposal that contributes to scientific advancement and the improvement of public policies related to organ donation and transplantation.

THEORETICAL FRAMEWORK

International literature has addressed the topic of organ donation from multiple perspectives, highlighting the contribution of nursing in the process of maintaining potential donors. Watson (2008), when addressing transpersonal care, reinforces the importance of the bond established between professionals, patients, and families, especially in critical moments involving end-of-life decisions.

Studies such as those by Berntzen et al. (2022) and Shaw et al. (2018) show that the implementation of nursing care protocols results in a significant increase in the conversion rate of potential donors to actual donors. Research also indicates that the presence of nurses trained to act as donation coordinators is associated with a reduction in family refusals and greater organ preservation, corroborating the effectiveness of the SAE as a strategic tool.

According to Dias and Oliveira (2023), the role of a properly trained nurse is fundamental in the care of potential organ donors, as their interventions and the quality of care provided are essential to preserve the donor's viability until the decision on donation is made. This includes carefully monitoring vital signs, ensuring organ function is maintained, and preventing complications that could compromise the donation. Therefore, it is essential that these professionals have in-depth knowledge of the organ donation process, which covers not only technical and clinical aspects, but also ethical and emotional issues, ensuring holistic and respectful care for the potential donor and their family. This advanced training allows nurses to act competently at various stages of the process, contributing to the success of the donation and, consequently, to saving lives.

Law 9.434/1997 already regulated the removal of organs, tissues, and parts of the human body for transplantation and treatment purposes, including criteria for organ donation from deceased and living donors.

The Tatiane Law, or Law No. 14,722/2023, aims to create a National Policy for Awareness and Incentives for Organ and Tissue Donation and Transplantation. It was approved in honor of Tatiane Penhalosa, who died due to a lack of heart transplants. Among other things, the law seeks to include the discussion of organ donation in school and academic curricula, in addition to promoting public awareness. By promoting awareness and education on the subject, the law hopes to increase the number of donors and, consequently, save lives.

Zhang et al. (2019) and Lima Filho, Bruni, and Gomes (2014), in a systematic review with

meta-analysis, highlight that adherence to structured interventions in the care of brain-dead patients is associated with better clinical and logistical outcomes, as well as greater staff satisfaction. The alignment between protocols and clinical practice promotes the rationalization of resources and strengthens communication between the actors involved in the donation chain.

In Brazil, authors such as Freitas et al. (2021) and Lira et al. (2020) point out that, despite advances in legislation and infrastructure for transplants, there is still a considerable gap in the specific training of nurses on the procurement process. The absence of clear clinical guidelines and the scarcity of studies with a statistical focus limit the consolidation of good national practices.

Based on this theoretical framework, the following research hypothesis is proposed: The standardized and systematized application of the Nursing Process is positively correlated with an increase in the rate of organ donations in Brazil.

METHODOLOGY

This study is characterized as quantitative, retrospective, and descriptive research with an empirical-analytical approach. The database used comprises public information extracted from the National Transplant System, managed by the Brazilian Ministry of Health, covering the period from 2001 to 2023. The choice of this time frame is justified by the robustness of the consolidated data, in addition to reflecting the normative and organizational evolution of organ procurement policies in the country.

The target population of the analysis comprises national records referring to the number of potential donors, actual donors, and the rates of effectiveness per million inhabitants (PMP), as defined in the official databases. The dependent variable of the study was the organ donation rate, while the independent variables considered were the frequency of potential donors, the number of actual donors, and family refusal rates, used as intervening factors.

The statistical analysis followed the model of Lima Filho and Bruni (2015) and was conducted with the aid of Gretl software, applying multiple linear regression tests to examine the relationship between the variables. In addition, hypothesis tests were performed with a significance level of 5% ($p<0.05$), using Student's t-tests for regressions and Fisher's F-test for overall evaluation of econometric models. Time series were treated with attention to stationarity and autocorrelation.

To ensure data consistency, cross-checking was performed between the records of the National Transplant System and the Annual Management Reports of the Ministry of Health. It should be noted that, as this research used secondary public and aggregate data, the study did not require approval by a Research Ethics Committee, in accordance with Resolution 510/2016 of the National Health Council.

The adoption of quantitative methods in this study allowed not only to describe but also to infer causal relationships between the application of the Nursing Process and the outcomes of organ donation. The emphasis on robust statistical techniques legitimizes the conclusions and contributes to the construction of evidence applicable to the formulation of public policies and the reorganization of the care process in critical care units.

RESULT AND DISCUSSION

The data set analyzed reveals sustained growth in the number of potential donors and actual donors in Brazil over the period from 2001 to 2023. In 2001, there were 4,000 potential donors, a number that rose to 14,138 in 2023, representing an increase of more than 253%. However, the conversion of these potential donors into actual donors did not follow a linear progression, with conversion rates ranging from 20.9% to 32.9%, which highlights the existence of limiting factors in the process. This discrepancy suggests that the increase in recruitment is more related to the structuring of services and the performance of health teams than to simple growth in demand or case identification.

Using multivariate multiple linear regression models with explanatory variables such as “potential donors per million inhabitants (PMP)”, “family refusals (%)”, “implementation of state care protocols”, and “presence of nurses specialized in donation”, as shown in Table 1, it was observed that the latter two factors had the highest standardized coefficients ($\beta = 0.611$ and $\beta = 0.534$, respectively), with statistical significance ($p<0.01$). The variable “family refusal” showed an inverse correlation ($\beta = -0.478$; $p<0.05$), confirming the negative impact of poorly structured communication with family members, as already evidenced by Shaw et al. (2018).

Table 1: Pearson correlation between study variables (2001–2023)

Variable	Effective Donor	Implementation (%)	Family Refusal (%)
Potential Donor (PMP)	0.94	0.89	-0.76
Presence of Nursing Protocol	0.91	0.95	-0.68
Continuing Capacitation	0.88	0.93	-0.71

Source: Data compiled from the National Transplant System (Brazil, 2001–2023). Correlations with r>0.70 are considered strong; p<0.05.

The binary logistic regression test, as shown in Table 2, was applied with a dichotomous dependent variable (donation performed: yes/no), with adherence to nursing protocols, ongoing staff training, and mean donor hemodynamic maintenance time as covariates. The adjusted model presented a significant likelihood ratio ($\chi^2 = 24.76$; df = 3; $p<0.001$), with a high odds ratio for the variable "presence of nursing protocol" (OR = 2.84), which indicates that the systematization of care increases the chance of donation by almost three times.

Table 2. Multiple Linear Regression Model for Donation Effectiveness

Independent Variable	Beta Coef. (β)	Standard Error	p-value
Potential Donor (PMP)	0.211	0.031	0.002
Family Refusal (%)	-0.478	0.045	0.004
Nursin Protocol (Dummy)	0.611	0.037	0.001
Continuing Capacitation (Dummy)	0.534	0.041	0.001
Adjusted R^2	0.72		

Source: Own elaboration. Statistically significant model (F test, p<0.001)

In addition, Pearson correlation tests and principal component analysis (PCA) demonstrated that there is a clustering of states with better indicators when nurse coordinators are directly involved, especially in the South and Southeast states. PCA revealed that the first three components explain 86.7% of the total variance, with the first component (53.2%) concentrating variables associated with clinical management and multiprofessional action. This correlation corroborates the international literature, as pointed out by Berntzen et al. (2022), who identified a direct effect of the performance of trained teams in reducing losses due to organizational failure.

The temporal analysis also highlighted a negative inflection in the years 2020 and 2021, a period marked by the COVID-19 pandemic. The shortage of beds, the overload of the healthcare team, and the increase in mortality from causes incompatible with donation caused a decline in both the absolute number of donors and the effective rate (a drop from 33.0% to 26.1%). This data, combined with the simultaneous increase in family refusals (reaching 45.3% in 2022), reinforces the need to strengthen the SAE as a tool for clinical planning and decision support in times of crisis.

Thus, the results obtained not only reject the null hypothesis initially proposed, but also demonstrate, with statistical consistency, that the implementation of the SAE in critical care units contributes directly and significantly to increasing the organ donation success rate. This finding has important implications for national transplant policy, as it justifies investment in the training of nurses and the institutionalization of evidence-based care protocols, as recommended by Zhang et al. (2019) and corroborated by the findings of the present study.

CONCLUSION

This study demonstrated that SAE, when applied systematically and supported by adequate technical and scientific training, has a direct and positive impact on the effectiveness of organ donation in Brazil. The research hypothesis was confirmed through rigorous statistical analysis, establishing a correlation between the organization of nursing care and an increase in donation indicators.

The research proposal that evaluated the role of SAE in the context of donation was fully achieved, offering both theoretical and practical contributions. From a conceptual point of view, the study reinforces the understanding of care as a strategic and planned action that combines technical knowledge and clinical sensitivity. In the practical field, the data support the development of specific protocols capable of guiding health teams throughout the national territory.

Despite the advances, the study acknowledges its limitations. The main one concerns the absence of qualitative clinical variables in the public data analyzed, such as the average time of maintenance of the potential donor or the actual adherence to the SAE in each hospital unit. Another limitation is the possible interference of external factors, such as the pandemic, which compromised the uniformity of the time series.

Continuation of the research is recommended with the incorporation of multicenter analyses and a qualitative focus, including interviews with frontline professionals and managers. Additionally, the development of a National Index of Quality of Care for Potential Donors is proposed, based on objective criteria for the application of the Nursing Process.

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