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ORIGINAL ARTICLE

EVOLUTION OF ORGAN AND TISSUE TRANSPLANTS: ALTERNATIVES TO THE SURVIVAL OF PATIENTS ON WAITING LIST

EVOLUÇÃO DOS TRANSPLANTES DE ÓRGÃOS E TECIDOS: ALTERNATIVAS PARA A SOBREVIVÊNCIA DE PACIENTES EM FILA DE ESPERA

EVOLUCIÓN DE LOS TRASPLANTES DE ÓRGANOS Y TEJIDOS: ALTERNATIVAS PARA LA SUPERVIVENCIA DE LOS PACIENTES EN LISTA DE ESPERA

Milleni Sousa Vieira¹, Lidya Tolstenko Nogueira², Railina Laura Uyara Brandão Sales³

ABSTRACT

Objective: to analyze the evolution of organ and tissue transplantation. **Methodology:** descriptive, documental, evaluative research with a quantitative approach. Data collection was carried out from October to December 2011, through a form used as instrument. Data were extracted from the registration system of the Organ Notification, Procurement, and Distribution Center of Piauí (CNCDO-PI) and the Brazilian Association of Organ Transplantation, involving all data within the period from 2001 to 2011. The approval by the Research Ethics Committee of Universidade Federal do Piauí came through the CAAE 0159.0.045.000-11. **Results:** the years from 2002 to 2004 concentrated 42.3% of total brain deaths confirmed. From 2009 to 2011 there was an increase in the number of cornea donations, representing 67% of tissue donations in the period. Since 2009, the total number of transplants increased by 46% in the state. The data revealed significant difficulties to arrange the donation after brain death. Among the causes for non-occurrence, one finds medical contraindications (37.9%), lack of family consent (19.7%), inadequate infrastructure (16.7%), and cardiorespiratory arrest (25.7%). **Conclusion:** despite the growth in the number of donations and transplants in the period, improvements in the effective rate of donation are needed, and they assume the evaluation of causes for non-occurrence. These should be object of specific analysis, in order to identify and correct drawbacks in the process of donation/transplantation, providing agility in the diagnosis of brain death, increased procurement of solid organs, and a consequent decrease in the queue. **Descriptors:** transplantation; health evaluation; nursing.

RESUMO

Objetivo: analisar a evolução dos transplantes de órgãos e tecidos. **Metodologia:** pesquisa descritiva, documental, avaliativa de abordagem quantitativa. A coleta de dados ocorreu de outubro a dezembro de 2011, por meio de um formulário utilizado como instrumento. Os dados foram extraídos do sistema de registro da Central de Notificação, Captação e Distribuição de Órgãos do Piauí (CNCDO-PI) e da Associação Brasileira de Transplantes de Órgãos, envolvendo a totalidade dos dados entre 2001 e 2011. A aprovação pelo Comitê de Ética em Pesquisa da Universidade Federal do Piauí ocorreu mediante o CAAE n. 0159.0.045.000-11. **Resultados:** os anos de 2002 a 2004 concentraram 42,3% do total de morte encefálica confirmada. De 2009 a 2011 ocorreu um aumento do número de doações de córneas, correspondendo a 67% das doações de tecidos no período. A partir de 2009, o total de transplantes aumentou em 46% no Estado. Os dados revelaram dificuldades significativas para a efetivação da doação em morte encefálica. Dentre as causas da não efetivação encontram-se as contraindicações médicas (37,9%), a não autorização familiar (19,7%), a infraestrutura inadequada (16,7%) e a parada cardiorrespiratória (25,7%). **Conclusão:** apesar do crescimento no número de doações e transplantes no período, melhorias na taxa de efetivação das doações são necessárias, e pressupõem a avaliação das causas da não efetivação. Estas devem ser objeto de análise específica, com vistas a identificar e corrigir as fragilidades do processo de doação/transplante, proporcionando agilidade no diagnóstico de morte encefálica, aumento da captação de órgãos sólidos e, a consequente diminuição da fila de espera. **Descritores:** transplante; avaliação em saúde; enfermagem.

RESUMEN

Objetivo: analizar la evolución de los trasplantes de órganos y tejidos. **Metodología:** investigación descriptiva, documental, evaluativa con abordaje cuantitativo. La recogida de datos ocurrió de octubre hasta diciembre de 2011, por medio de un formulario utilizado como instrumento. Los datos fueron extraídos del sistema de registro del Centro de Notificación, Captación y Distribución de Órganos de Piauí (CNCDO-PI) y de la Asociación Brasileña de Trasplantes de Órganos, con todos los datos entre 2001 y 2011. La aprobación por el Comité de Ética en Investigación de la Universidade Federal do Piauí ocurrió bajo el CAAE 0159.0.045.000-11. **Resultados:** los años de 2002 hasta 2004 concentraron el 42,3% del total de muerte cerebral confirmado. De 2009 hasta 2011 ocurrió un aumento en el número de donaciones de córneas, correspondiendo a 67% de las donaciones de tejidos en el período. A partir de 2009, el total de trasplantes se incrementó en 46% en el estado. Los datos revelaron significativas dificultades para la efectución de la donación en muerte encefálica. Entre las causas de la no efectución tenemos las contraindicaciones médicas (37,9%), la no autorización de la familia (19,7%), la infraestructura inadecuada (16,7%) y la parada cardiorrespiratoria (25,7%). **Conclusión:** a pesar del crecimiento en el número de donaciones y trasplantes en el periodo, mejoras en la tasa efectiva de donaciones son necesarias, y presuponen la evaluación de las causas de la no efectución. Estas deben ser objeto de análisis específico, con el fin de identificar y corregir las debilidades del proceso de donación/transplante, proporcionando agilidad en el diagnóstico de muerte encefálica, aumento de la captación de órganos sólidos y la consecuente disminución en la fila. **Descriptor:** trasplante; evaluación en salud; enfermería.

¹Nurse. MS student in Nursing at the Graduate Program in Nursing of Universidade Federal do Piauí (UFPI). Teresina (PI), Brazil. Email: millenisv@hotmail.com; ²Undergraduate Nursing student at UFPI. Scholarship holder of the Institutional Program for Scientific Initiation Scholarships (Pibic). Teresina (PI), Brazil. Email: railinamuse@hotmail.com; ³Nurse. Ph.D degree in Nursing obtained from Universidade Federal do Rio de Janeiro (UFRJ). Associate Professor of UFPI, developing activities in the undergraduate Nursing course and the MS Nursing Program. Teresina (PI), Brazil. Email: lidyatn@gmail.com.

INTRODUCTION

Performing transplants is an important achievement of the healthcare system and the society.¹ This procedure constitutes a well-established therapy, used as a last resort for the patient, when no other therapeutic possibilities are available or they haven't achieved effective results, yet. Thus, transplantation of organs and tissues presents itself as the last chance for survival of patients in queue.

The lack of transplantation procedures has negative impacts with regard to the probabilities of cure, the survival of grafts and patients, the nature and extent of sequelae in patients, in their family members, and the society. Indirect costs should also be considered, regardless of renal replacement therapies, which cost thousands of reais annually to the State.²

Brazil has the largest public program of organ and tissue transplantation in the world, and it's the second country with regard to the number of transplants performed per year, with more than 90% funded by the public health.³ Although the United States is the first country with regard to the number of transplants, it's worth noting that the Americans pay for their own transplants, either directly or through health insurances, except for the poorest ones.¹

The National Policy for Transplantation of Organs and Tissues is ruled by the Federal Laws 9,434/97 and 10,211/2001, taking as guidelines the free donation, the benefit for the recipient, and no negative impact on the health of a living donor.^{4,5} This policy established the National Transplantation System (SNT) as the entity responsible for coordinating and regulating the procurement and distribution of organs in the states, through the State Transplantation Centers, as well as promoting public awareness about the importance of the donation/transplantation process.

SNT presents itself as a management entity of the Health Ministry whose role is to operationalize the healthcare network of transplantation, authorizing the activity of healthcare institutions and staffs.⁶ Each state has an Organ and Tissue Notification, Procurement, and Distribution Center (CNCDO), connected to SNT, which coordinates the notification, procurement, and distribution of organs at the state level, as well as a single regional list. CNCDO carries out these activities nationwide. SNT aims to

allow reliability on the actions involving transplantation and, at the same time, provide good quality healthcare for donor/recipient. For this, it has 555 healthcare facilities, performing 798 transplantation procedures, and 1,376 medical staffs are authorized to perform transplants.

Considering the need to implement strategies for improvement of the donation/transplantation process and the confirmation of donors, Intra-Hospital Commissions of Organ and Tissue Donation for Transplantation (CIHDOTT) and Organ Procurement Organizations (OPO) have been established. Their actions are carried out above the hospital level, they should organize and support activities related to the donation of organs and tissues, among them the maintenance of potential donor and the search for solutions and partnerships when drawbacks are identified in the donation process. CIHDOTT, in turn, should be present in all public, private, and philanthropic hospitals with more than 80 beds, and its assignments include the early detection of potential donors in the hospital where it operates, the notification of brain death (BD) diagnosis, and the connection to the CNCDO in the state concerned.^{7,8} In Piauí, the CIHDOTT of Hospital de Urgências de Teresina (HUT) was created in 2009, and the OPO, which operates in the hospital network of this city, was created in 2010.

In Brazil, there was a continued growth in the rate of donation and transplantation in 2010, reaching 9.6 actual donors per million people (pmp) with transplanted organs. Renal transplants totaled 4,630, with an increase of 8% when compared to 2009, being 64.6% with deceased donor, the highest rate ever obtained in the country. Liver transplants totaled 1,413, with an increase of 5.7%, almost reaching the previously established target of 1,500 liver transplants. Altogether, 50 873 transplants were performed, including those of solid organs, tissues and cells.³

In the first quarter of 2011, the actual donation rate was 8.8 pmp, below the rate of 2010, 9.6 pmp, and the rate previously established for that year was 11.5 pmp. There were 4,940 kidney transplants, 160 heart transplants, 1,492 liver transplants, 52 pancreas transplants, and 49 lung transplants. The transplants totaled 46,369, including those of solid organs, tissues, and cells.⁹

In Piauí, the Organ and Tissue Notification, Procurement, and Distribution Center

(CNCDO-PI) was inaugurated on September 25, 2000, three years after the enactment of federal law. One of the factors contributing to this implementation was the establishment of the healthcare policy directed towards transplants: the Health Ministry started requiring the installation of a Center in the federal units working with transplantation.¹⁰ As in other states, CNCDO-PI is located in the capital, Teresina, and it works under the management of the State Department of Health. Currently, Piauí focuses on transplants in that city, the only one able to do so.

Transplants are part of the Brazilian healthcare policies, and the distribution of organs and tissues is under public control. Thus, the evaluation process of this policy becomes relevant, contributing to the improvement of the management and healthcare quality mechanisms.

The assessment of policies or programs for social or healthcare intervention usually analyzes their structure, operational process, and outcomes.¹¹ The latter refers to the effects and products due to the actions and procedures, according to the intervention. The assessment should be an indispensable part for planning the policy or program, favoring decision-making.

OBJECTIVE

♦ To analyze the evolution of organs and tissues transplantation.

METHODOLOGY

This study is an adaptation of the dissertation "Performance assessment of the Organ and Tissue Notification, Procurement, and Distribution system of Piauí within the period 2001-2011", developed in the MS

Program in Nursing of Universidade Federal do Piauí (UFPI).

This is an evaluative, descriptive, and documental research, with a quantitative approach, carried out in the city of Teresina, Piauí, Brazil, in the physical setting of CNCDO-PI.

Data collection was carried out from October to December 2011 and it used a form as an instrument. The data had a secondary nature, extracted from the registration system of CNCDO-PI and the Brazilian Association of Organ Transplantation, involving all data within the period from 2001 to 2011.

Only the data related to the number of hospital deaths were extracted from the site of DataSUS (www.datasus.gov.br) and the Information System on Mortality (SIM), the latter with support from the Coordination of Analysis and Information on Status and Trends in Healthcare of the State Department of Health of Piauí.

The research project was approved by the Research Ethics Committee of Universidade Federal do Piauí (CAAE 0159.0.045.000-11).

RESULTS INTRODUÇÃO

Regarding the number of potential donors over the period 2001-2011, we observed an increase since 2010, however, the same didn't occur with regard to the number of actual donors. The years 2007 and 2008 showed a significant decrease in the number of potential donors and actual donors. In 2008, only one actual donor was registered in the state (Figure 1).

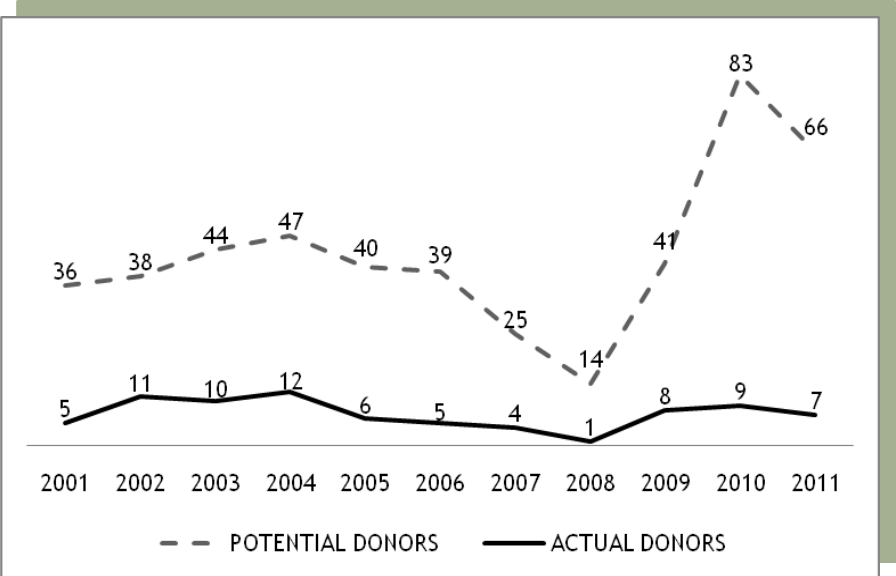


Figure 1. Number of potential donors and actual donors per year in Piauí, over the period 2001-2011. Source: ABTO, 2001-2011; CNCDO-PI, 2011.

Regarding the number and type of donations, it was observed that the years 2002 to 2004 stood out in terms of BD diagnosis, concentrating 42.3% of total confirmed BDs. In parallel, the years 2009 to 2011 stood out in

terms of the number of donations due to cardiorespiratory arrest (CRA), concentrating 67% of the corneal donations in the state over the period (Figure 2).

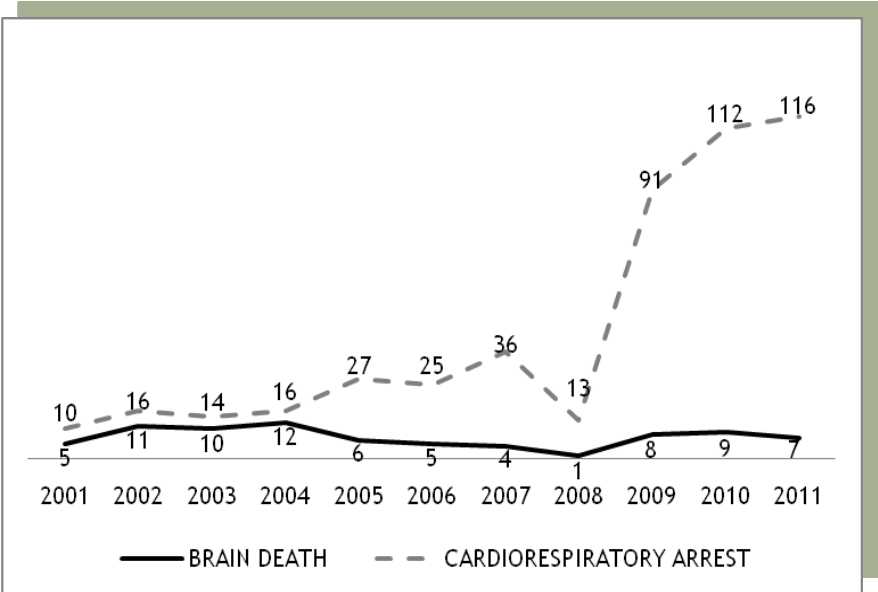


Figure 2. Number and types of donations per year in Piauí, over the period 2001-2011. Source: CNCDO-PI, 2011.

Regarding the number of hospital deaths occurred in Piauí due to all causes over the period, we observed a growing trend both for the state and its capital, Teresina. In 2001, there were 6,510 hospital deaths registered in Piauí and 4,049 deaths in Teresina. In 2011, 9,968 hospital deaths were registered in the state as a whole and 6,621 deaths in its capital. However, the growing number wasn't combined to a corresponding increase in the number of actual donors, as shown in Figure 1.

Regarding the number of transplants performed, data showed a clear increase since 2009, accounting for 46% of all transplants performed in the state from 2001 to 2011. This growth is primarily due to an increase in the number of corneal transplants, enabled by the rise of donations in CRA over the period. On the other hand, the demand for transplants, characterized by an increase in the number of patients in queue, was still higher than the supply (Figure 3).

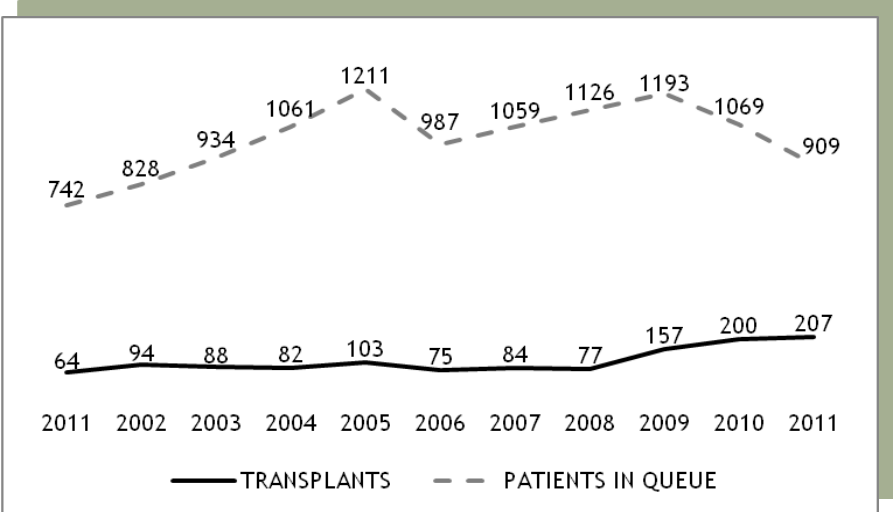


Figure 3. Number of transplants performed and patients in queue per year in Piauí, over the period 2001-2011. Sources: ABTO, 2001-2011; CNCDO-PI, 2001-2011.

Regarding the types of transplants performed, it was found that the corneal one had a higher number than the others, corresponding to 65.2% of transplants over the period. Next, there lies renal transplant and, finally, heart transplant, with 17 surgeries

performed from 2001 to 2011. It's noteworthy that heart transplant was performed for several years, but, since 2008, there's no staff nor institution accredited by the Health Ministry for this type of procedure in the state (Figure 4).

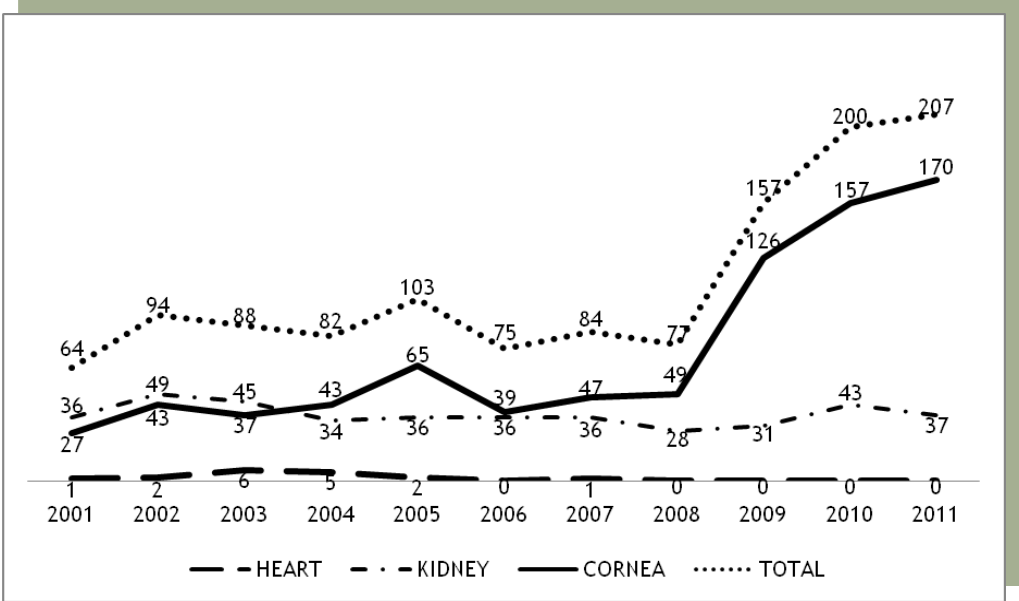


Figure 4. Number of transplants performed per year in Piauí, over the period 2001-2011. Source: ABTO, 2001-2011.

Regarding the non-occurrence of donations, a barrier was identified in the sector of transplantation in Piauí. Throughout the period, the percentage average of non-occurrence was 85.56%, which means that more than 85% of potential donors didn't

become actual donors. Among the causes that significantly contributed to the non-occurrence of donations are the lack of family consent and medical contraindications, followed by cardiorespiratory arrest and other events (Figure 5).

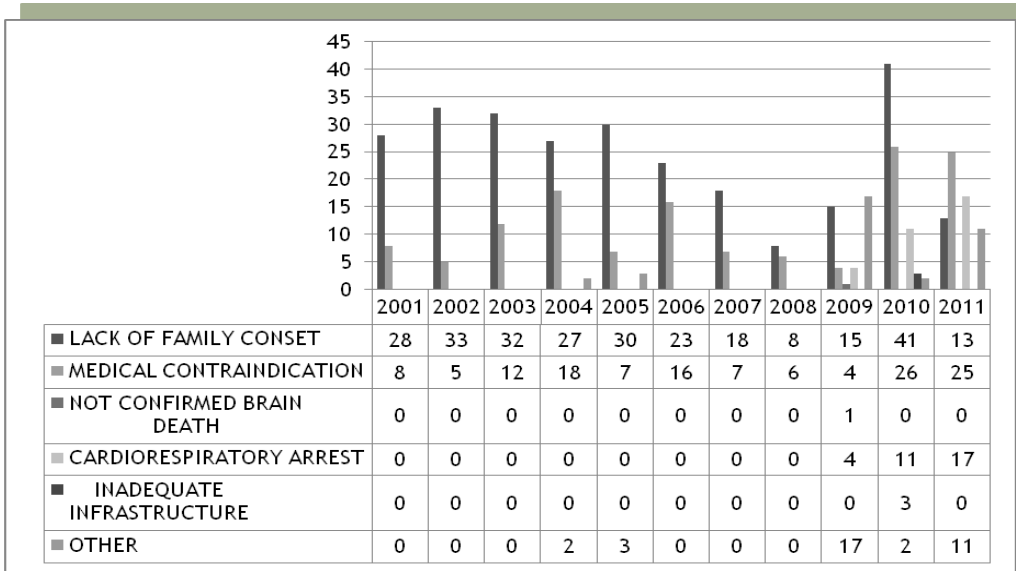


Figure 5. Number and causes of non-occurrence of donation per year in Piauí, over the period 2001-2011. Source: ABTO, 2001-2011.

Regarding where the transplants were performed, we observed the predominance of private institutions over public institutions. During the study period, 67.3% of transplants performed in Piauí were carried out in the private healthcare network.

In terms of the staffs and institutions authorized to perform transplants, we found a growing number of institutions throughout the period. In 2001, 3 facilities were accredited by SNT and, in 2011, 6 facilities were allowed to perform transplants.

During the period analyzed, notifications, donations, and transplants were concentrated in Teresina. The geographical distribution of procedures in the transplantation sector in Piauí is related to the installed capacity in the capital, which has the only public hospital

able to carry out the surgeries, concentrating, almost exclusively, the high complexity observed in the state.

Discussion

The results showed an increased number of notifications of potential donors since 2010, indicating the contributions from CIHDOTT HUT and OPO, simultaneously. This increase allowed the ratio of the number of reports per hospital deaths in the same year presented the best index of the period, 13.8 notifications per thousand hospital deaths in Teresina, where these commissions operate, and 6.6 notifications per thousand deaths, considering all hospital deaths in the state in the same year. This ratio indicates the proportion of notifications with regard to hospital deaths occurred in a given period,

and it's considered an indicator of performance in the sector of transplantation.¹²

Concomitantly, we observed an increase in the number of donations in the period 2009-2011, provided by the work of CIHDOTT HUT and OPO, as well as the work of the Ocular Tissue Bank (BTOC), an institution responsible for procuring corneas. However, donations due to cardiorespiratory arrest still predominate, which involves only the removal of corneas, with no use of solid organs. There isn't an *a priori* age limit for corneal donation. The removal of corneas may be performed in virtually all donors within six hours after death¹³, something which favors an increase in the number of such procedures.

Data showed significant difficulties in the sector of transplantation for confirming the donation. In 2011, the rate was only of 10%, which means that 90% of potential donors were not turned into actual donors. Among the causes of non-occurrence stood out medical contraindications (37.9%), lack of family consent (19.7%), factors related to the infrastructure (16.7%), and the occurrence of cardiorespiratory arrest (25.7%) before completion of BD diagnosis.

The lack of adequate infrastructure, resources, and enough personnel to provide BD patients with support are factors limiting an increase in the number of donations and transplants in the Unique Health System (SUS). From the confirmation of a donation to the location of a compatible recipient not less than 24 hours are needed, considering the compliance with all legal requirements; moreover, the difficult choice between maintaining a BD donor or admitting a patient alive in the ICU may emerge.¹⁴

Simultaneously, there's still the need for adequate training of healthcare professionals for the diagnosis of BD and the early identification of a potential donor.¹⁵ The awareness of these professionals is essential for the operation of the donation/transplantation process.

In addition to these difficulties there's the fact that, in Piauí, the complementary exam used for the diagnosis of BD, as recommended by the Resolution 1,480/97¹⁶, from the Brazilian Federal Council of Medicine (CFM), is arteriography, carried out in a private clinic accredited by SUS. In practice, this means the displacement of a potential donor from the facility where she/he is hospitalized to this clinic, demanding many professionals and resources simultaneously. Often, this transportation depends on the availability of

the advanced staff from the Mobile Emergency Care Service (SAMU), responsible for dealing with other complications, and the availability of a clinical professional, considering that few professionals in the state are trained to perform arteriography. Thus, one may infer that, besides the factors related to the infrastructure, a portion of the cardiorespiratory arrests occurring before completion of BD diagnosis are also related to logistical constraints.

Also in 2011, 28 (42.4%) donations weren't confirmed due to factors related to the infrastructure and CRA. This number could have been decreased if the complementary exam for the diagnosis of BD was performed at the same hospital and, preferably, at the patient's bedside. The poor ability of the hospital network to provide a quick diagnosis of the loss of brain functions constitutes an obstacle for the success of organs donation.¹⁷

Positively, the number of transplants showed a significant increase, due to the growth in number of donations. The greatest part of this increase, however, is represented by the corneal transplantations. This predominance occurs in the study period as a whole, and it is demonstrated by the increasing curve in Figure 4. In 2011, for instance, 82.1% of transplants performed in Piauí were corneal ones. It's worth recalling that, currently, only two types of transplantation are performed in the state, the transplantation of corneas, regarded as a tissue, and the transplantation of kidneys.

In the same year, we observed among kidney transplants that 59.5% had organs from living donors. In Brazil, since 2008, kidney transplants with a deceased donor are more frequent than those with a living donor. Except in a few isolated years, this trend isn't observed in Piauí. Thus, in that state, in 2011, the rate of kidney transplants with living donors was 7.1 pmp, and those with deceased donors was 4,8 pmp.⁹ These numbers corroborate the limitations in order to turn a potential donor into an actual donor.

As observed in other Brazilian states, such as Bahia, Pernambuco, Rio de Janeiro, and São Paulo, the queue of patients waiting for a transplant is greater than the supply of organs and tissues.¹⁸ In the case of Piauí, both with regard to corneas and kidneys, the number of patients in the queue exceeds the volume of transplants. One of the justifications for the low rates of transplants is the shortage of organs. Besides the difficulties for procuring them among potential donors, the lack of awareness in the society with regard to the importance of donation still predominates.¹⁹

This is evidenced by the high rate of lack of family consent to donate throughout the study period, contributing to the increase of the queue and, simultaneously, to decrease the survival rate of patients waiting for an organ.

In Piauí, another reality is the organization of the sector of transplantation with regard to the setting to perform these surgical procedures. Over the period 2001-2011, it was found that transplants were carried out predominantly in private institutions. This is due to the fact that the state has only one hospital from the state network of public healthcare able to perform transplants, in Teresina. The other institutions belong to the private healthcare network.¹⁰

CONCLUSION

Analyzing the evolution of transplants in Piauí after a decade of operation of the Transplantation Center from this State, we found out advances marked by the implementation of CIHDOTT and OPO, as well as the creation of BTOC and an increase in the number of donations and transplants, with the restriction that most donations correspond to CRA.

However, challenges still remain with regard to CNCDO-PI. Among them, one of the key is to enable an increase the rate of actual donations due to the increase in the number of BD donors. Only this type of donor allows the procurement of solid organs, providing an increase in the supply of kidney transplants and the availability of other organs for the National Center.

Improvements in the rate of actual donations necessarily assume the assessment of causes for non-occurrence. As shown by the results, the lack of family consent still remains as one of the main obstacles to the supply of organs.

The lack of family consent isn't related to social, cultural, and religious issues, which often permeate the lack of dialogue within the family about donation. However, lack of knowledge on the donation/transplantation process also favors the family's denial. Thus, the disclosure of information and continued education aiming to raise public awareness should be part of the sector's policy.

The occurrence of CRA before the completion of BD diagnosis and the inadequate infrastructure, although related to a lesser extent to the failure to confirm donations, should undergo a specific analysis, in order to identify and correct the drawbacks of this process, enabling quicker BD diagnoses.

Moreover, it is believed that the results of this study may contribute with information involving the specificities of the transplants in the state, with the aim of strengthening a management policy and the recognition that success in the donation/transplantation process depends not only on the actions from the Public Power, but the integration of these actions to the healthcare professionals practice and the attitude of society as a whole, with the goal of enabling alternatives for patients in the queue.

The results analyzed in this research may have been influenced by the technological and administrative structure of the institutions involved in the donation/transplantation process. Thus, further studies are suggested for approaching such elements.

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Corresponding Address

Milleni Sousa Vieira

Cd. Serra da Capivara

Av. Pres. Jânio Quadros, 580 — Bl. Pedra

Furada, Ap. 303

Bairro Santa Isabel

CEP: 64.053-390 — Teresina (PI), Brazil