



Notification of brain death in the hospital

Notificação da morte encefálica em ambiente hospitalar

Notificación de la muerte encefálica en ambiente hospitalario

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Objective: to identifying brain death in the hospital. **Methods:** it is a cross sectional and quantitative study which analyzed secondary data extracted from the notified brain death registers and from the medical records of the eligible patients. The data were processed and analyzed through descriptive statistics and comparisons. **Results:** of the 64 cases of notifications, the male gender predominated (67.2%) within the age range from 40 to 59 years (64.1%). There was a greater proportion (71.8%) of causes of death related to Hemorrhagic Cerebral Vascular Accident and Traumatic Brain Injury caused by motorcycle accident, showing statistically significant difference ($p < 0.05$) regarding the gender, age and location. **Conclusion:** the Hemorrhagic Cerebral Vascular Accident was the most prevalent cause of notification of brain death and the Intensive Therapy Unit was the most notified venue.

Descriptors: Nursing; Brain Death; Health Profile; Tissue Donors.

Objetivo: identificar a notificação da morte encefálica em ambiente hospitalar. **Métodos:** estudo transversal e quantitativo analisou dados secundários, extraídos dos registros de morte encefálica notificados e dos prontuários dos pacientes elegíveis. Os dados foram processados e analisados por estatística descrita e comparações. **Resultados:** de 64 casos de notificações, predominou o gênero masculino (67,2%) e faixa etária de 40 a 59 anos (64,1%). Ocorreu maior proporção (71,8%) de causas do óbito relacionados ao Acidente Vascular Encefálico Hemorrágico e Traumatismo Crânio Encefálico por acidente de moto, demonstrado diferença estatisticamente significativa ($p < 0,05$) com relação ao gênero, idade e zona geográfica. **Conclusão:** o Acidente Vascular Encefálico Hemorrágico foi a causa mais prevalente de notificação de morte encefálica e a Unidade de Terapia Intensiva sendo o ambiente mais notificado.

Descritores: Enfermagem; Morte Encefálica; Perfil de Saúde; Doadores de Tecidos.

Objetivo: identificar la notificación de muerte encefálica en ambiente hospitalario. **Métodos:** estudio transversal y cuantitativo que analizó datos secundarios extraídos de los registros de muerte encefálica notificados y de los registros médicos de los pacientes elegibles. Datos procesados y analizados por estadística descrita y comparaciones. **Resultados:** de 64 casos de notificaciones, predominó el género masculino (67,2%) y faja de edad de 40-59 años (64,1%). Hubo mayor proporción (71,8%) de muerte por causas relacionadas con el Accidente Cerebrovascular Hemorrágico y Traumatismo Cráneo Encefálico por accidente de moto, señalándose diferencia estadísticamente significativa ($p < 0.05$) con respecto al género, edad y zona geográfica. **Conclusión:** el Accidente Cerebrovascular Hemorrágico fue la causa más frecuente de notificación de muerte encefálica y la Unidad de Cuidados Intensivos el entorno más notificado.

Descriptor: Enfermería; Muerte Encefálica; Perfil de Salud; Donantes de Tejidos.

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Introduction

Although the cardiac and lung functions have been known for centuries as essential for survival, the concept of death is not restricted to such fact, facing the possibility of maintenance of the vital function of the human being, even without the functioning of the brain. Based on neurological criteria of evaluation, death evolved to what is currently known as brain death⁽¹⁾.

Brain death is defined by a complete and irreversible stop of the brain functions, and it is only possible to maintain the cardiac and respiratory functions through artificial means with the help of devices, thus characterizing the clinical death of the patient⁽²⁾.

The current guidelines for the diagnosis of brain death created in 1981 were established during the works of the Presidential Committee for the study of ethical problems in Medicine of the United States of America. More detailed criteria started to be used, such as the correct identification of the patient, reason of the coma, its irreversibility, the elimination of metabolic causes and exogenous intoxication⁽³⁾.

The diagnosis of Brain Death occurs through two clinical exams, one of them is made by a neurologist, to prove the absence of supraspinal motor activity and apnea; the other is a complementary test to prove the absence of brain blood flow, electric or metabolic activity of the brain^(2,4).

There are several images exams which can be used to confirm the diagnosis of brain death, such as: electroencephalogram, brain angiography, computerized tomography, monitoring intracranial pressure, chemical markers of cerebrospinal fluid, transcranial Doppler, scintigraphy and auditory evoked potentials and the brain stem⁽⁵⁾.

Among the basic causes of brain death are the Cerebral Vascular Accident and Traumatic Brain Injury, the Central Nervous System Tumor and the Anoxic Encephalopathy⁽⁶⁾. It is estimated that the proportion of brain deaths is 60 to every one million

inhabitants per year, corresponding to 12% of the deaths which occur in the Intensive Therapy Unit of a large general hospital⁽³⁾. In Brazil, in the first quarter of 2014, 2,214 cases of brain death were notified⁽⁷⁾.

Considering the relevance of the prevalence of brain death for the collective health, and its close relation with the donation of organs, data referring to the possible causes of brain death are observed as an important tool for the planning directed to the actions of the health services^(6,8). Such actions are made feasible though public policies turned to the adequate prevention and intervention, considering base diseases which can result in a situation of brain death or influence it, at all levels of attention to health.

Although the interest on this theme is growing nationwide, the occurrence of investigation and studies on the prevalence of brain death, especially in the northeastern region is still scarce, being more frequent in other regions of the country^(2,6,8-12).

The diagnosis of brain death is seen as a complex process, so, it is important to provide data which can make auxiliary strategies of the reduction of its occurrence feasible. Through information such as demographic data, origin, cause of death, type of complementary exam used, it is possible to know the local reality and to offer tools for the elaboration of public policies in order to provide a better solution for this problem, thus justifying the making of this study.

The present research has as objective to show the description of the notification of brain death in a public hospital in Petrolina, PE, Brazil.

Method

It is a descriptive cross sectional research with quantitative approach, analyzing cases of brain death which occurred from January 2011 to June 2011, with a total of 30 months.

The venue of evaluation was the Hospital Universitário Doutor Washington Antônio de Barros da Universidade Federal do Vale do São Francisco in the county of Petrolina, PE, Brazil. It is a service of

reference of high complexity in trauma orthopedics services, neurosurgery and intensive therapy, concentrating the highest number of notifications of brain death in the region that also collects multiple organs through the national system of transplant, an organ of the health department. It renders public assistance to patients of the county and neighboring regions. Another venue from research was the Central de Notificação, Captação e Distribuição de Órgãos de Pernambuco – Macrorregional Petrolina, PE, the notifications of brain death were obtained in this venue, whose variables of interest were: identification of the patient and the date of brain death.

The data collection was obtained from the information of secondary sources of data, as follows: 1) Registers of brain death and 2) Medical registers.

Afterwards, the medical records of the eligible patients were analyzed and filed in the service of medical and statistic file of the referred hospital.

The 103 notifications of brain death were analyzed according to the following adopted criteria: register of information of the three evaluations required for the conclusion of brain death, subjects from both genders, which evolved to brain death, assisted in the emergency room and intensive therapy unit of the university hospital. The registers of protocol of brain death without conclusion and which did not report the cause of brain death were not considered. So, 64 cases of brain death were included for this study.

There were variables of interest such as social demographic data of the patient and the information regarding the notification of brain death, as follows: cause, time, sector of diagnosis, complementary method of diagnosis, whether the subject was a donator of organs and tissues and which organs and tissues were collected in case of donation.

The data were processed and analyzed with the support of the Epi INFO (CDC, Atlanta, GA, EUA, version 7.1.3, 2013) statistic package, through spreadsheets with formulas obtained according to the literature of the biostatistics. The results were presented in

distributions of absolute and relative frequencies: measures of central tendency and dispersion. For the comparison of the frequencies within one distribution the exact Fisher and expanded Fisher's test were used. In all the tests used in the research, the result was evaluated as significant if the value was $p < 0.05$.

This research was submitted to the evaluation of the Committee of Ethics in Research with Human Beings of the University of Pernambuco, being approved under protocol no. 425016 and elaborated according to the precepts established in Resolution 466/12 of the National Council of Health.

Results

In the period studied, of the 64 notifications of brain death, seven (9.1%) occurred in 2011, 37 (57.8%) in 2012 and, only in the first semester of 2013 20 (31.2%) cases of brain death were notified. The age of the subjects ranged from 15 to 75 years (average of 41.6 years and standard deviation of 15.5), there was a predominance of the male gender (67.2%). Due to the absence of data, the information on ethnic groups and schooling were not considered (Table 1).

Table 1 - Distribution of the characteristics of subjects with diagnosis of brain death

Variables	n (%)	CI 95%
Gender		
Male	43 (67.2)	54.31 – 78.41
Female	21 (32.8)	21.59 – 45.69
Age range (years)		
15-19	6 (9.4)	03.52 – 19.30
20-24	7 (10.9)	04.51 – 21.25
25-39	17 (26.6)	16.30 – 39.09
40-59	24 (37.5)	25.70 – 50.49
≥ 60	10 (15.6)	07.76 – 26.86
Cause of death		
Hemorrhagic Cerebral Vascular Accident	23 (35.9)	24.32 – 48.90
Traumatic Brain Injury caused by motorcycle accident	13 (20.3)	11.28 – 32.23
Others*	28 (43.8)	31.37 – 56.72

*Traumatic Brain Injury caused by running over, Ischemic Cerebral Vascular Accident, Tumors of Central Nervous System and Hydrocephaly

Because of most (n=46/71.8%) of the cases of brain deaths occurred due to Hemorrhagic Cerebral Vascular Accident and Traumatic Brain Injury caused by motorcycle accident, they were analyzed separately in order to know other characteristics.

For the victims of Hemorrhagic Cerebral Vascular Accident the age range was 48 years with the standard deviation of 14.1 years and for the Traumatic Brain Injury caused by motorcycle accident the average age was 26.2 and standard deviation of 11.5 years. There was a statistically significant difference both for the cases of Hemorrhagic Cerebral Vascular Accident as well as for the cases of Traumatic Brain Injury caused by motorcycle accident only regarding gender, age and location (Table 2).

Table 2 - Distribution of the subjects with brain death regarding the most frequent causes

Variables	Hemorrhagic Cerebral Vascular Accident n (%)	Traumatic Brain Injury caused by motorcycle accident n (%)	p value
Gender			
Female	9 (39.1)	1 (7.7)	0.041*
Male	14 (60.9)	12 (92.3)	
Age range (years)			
15-19	1 (4.4)	3 (23.1)	
20-24	-	5 (38.5)	
25-39	5 (21.7)	4 (30.8)	<0.001*
40-59	12 (52.2)	-	
60 or older	5 (21.7)	1 (7.7)	
Location			
Urban	19 (82.6)	6 (46.2)	0.025*
Rural	4 (17.4)	7 (53.8)	
Sector of notification			
Emergency	1 (4.4)	1 (7.7)	0.474
Intensive Therapy Unit	22 (95.6)	12 (92.3)	
Complementary exam			
Angiography	20 (86.6)	12 (92.3)	0.390
Electroencephalogram	3 (13.4)	1 (7.7)	
Donation of organs			
Yes	10 (43.5)	4 (30.8)	0.215
No	13 (56.5)	9 (69.2)	

* p < 0.05

Discussion

The recognition and notification of brain death is one of the most important advents in the current scenario of health, facing the magnitude of the benefits which the transplant provides. Even though a diagnosis of compulsory notification of brain death once confirmed in a health unit the study showed that only 62.1% of the open protocol were concluded, presenting gaps of essential information for an adequate knowledge of the diagnosis of the notification of brain death at the venue evaluated.

The problem related to the conclusion of the protocol of brain death can be resulting from the lack of knowledge of the professionals on the obligation of notification provided by law^(1,4,13-15).

It was observed that there was a notorious growth in the number of notification each year in the hospital institution researched. This growth can be associated to the implementation of the Organization of Search for Organs in the year 2012 in loco, which has a team of trained nurses in the search of patients with possible diagnosis of brain death, in order to make them potential donors^(14,16).

It is important to value the need of preparation of the multi professional team, once the success of the effectiveness of the donation of organs and tissues is directly proportional to the precocity of the notification of brain death⁽¹⁷⁾, as well as the correct following of the stages of this process with the filling and signature of the neurological exams and report of the complementary exam which determines brain death⁽¹⁸⁾.

Another relevant factor for the non-conclusion of the protocol is the logistics for the making of the evidential exam⁽¹⁰⁾, once the institution where the research took place did not have the complementary exam by the bed to confirm the diagnosis. The patients which had their protocols opened in this period were transferred to another health unit in order to have a cerebral angiography.

The cerebral angiography, the electroencephalogram and the transcranial Doppler are the mostly used complementary tests in Brazil⁽²⁾, confirming the findings in this research.

The state of Pernambuco has shown increasing numbers of notifications of brain death and effective donors. In the period 2011-2013, 1,417 notifications were made⁽¹⁹⁾. However, this study is the first to establish a profile of patients with brain death in the region of Vale do São Francisco, once the previous studies specifically approached the profile of donors of organs^(2,11-12).

Regarding the gender, the results found are similar to the ones analyzed by the Brazilian Association of Transplants in the first quarter of 2014, in which there is a predominance of registers of the male gender⁽⁷⁾. It is supposed that these results are due to the fact that men get more involved in car accidents, and are more resistant in taking care of their own health, thus causing chronic diseases, such as hypertension⁽²⁰⁾.

In a study made in Santa Catarina, the main causes of identified brain deaths were Hemorrhagic Cerebral Vascular Accident (50.8%), followed by Traumatic Brain Injury (44.1%)⁽²⁾, such characteristic of double profile was equally identified in the research.

Most of the organs and tissues donated were cornea, kidney and liver, following the standard of the state of Pernambuco which makes transplant of heart, liver, kidneys, pancreas, bone marrow and corneas⁽¹⁹⁾.

In this conjecture, every serious patient, even after having the suspicious of brain death, needs to be treated seriously by all members of the team, once carelessness in this period can lead to a malfunction of organs in the potential donor⁽¹⁸⁾. The nurse, as a professional directly involved in assisting the patients, must help in the care, avoiding the loss of organs by intercurrent during the process of determination of brain death⁽²¹⁾.

Final Considerations

Facing the results of this research, it is possible to infer that the implications are relevant, concluding that in the notified cases of brain death, there was a predominance of the male gender, with age ranging from 15 to 73 years and average of 41.6 years, having the Hemorrhagic Cerebral Vascular Accident as the main cause of the notification of brain death in the period.

However, some limitation must be referred to, such as the fact of the absence of validated instrument of data collection, the data of the research come from a specific sample of a region in the countryside of the state of Pernambuco, not being possible to infer that the conclusions found should be applied in other Brazilian regions or worldwide. Another limiting factor was the inadequate and incomplete filling of the medical record which resulted in the loss of relevant data which contributed for the inclusion of the variables to be analyzed.

At last, it is suggested that the health teams should be motivated and trained aiming at the improvement of the process of notification of brain death. The frailties of the teams should be identified and resolved so that the whole process happens in a correct way and at the right time, thus avoiding the loss of potential organs and tissues donors. Besides that, as a pioneer study in the scenario of local health, it is important to develop future researches aiming at comparative results with other location, especially in the northeastern region.

Collaborations

Souza BSJ contributed for the conception of the project, writing of the article, analysis and interpretation of the data and critical revision of the article. Lira GG and Mola R participated in the conception of the project, relevant critical revision of the intellectual content and final approval of the version to be published.

References

- Freire SG, Freire ILS, Pinto JTJM, Vasconcelos QLDAQ, Torres GDV. Alterações fisiológicas da morte encefálica em potenciais doadores de órgãos e tecidos para transplantes. *Esc Anna Nery*. 2012; 16(4):761-6.
- Noronha MGO, Seter GB, Perini LD, Salles FMO, Nogara MAS. Estudo do perfil dos doadores elegíveis de órgãos e tecidos e motivos da não doação no Hospital Santa Isabel em Blumenau, SC. *Rev AMRIGS*. 2012; 56(3):199-203.
- Morato EG. Morte encefálica: conceitos essenciais, diagnóstico e atualização. *Rev Med Minas Gerais*. 2009; 19(3):227-36.
- Conselho Federal de Medicina. Resolução CFM Nº 1.480 de 8 de agosto de 1997: dispõe sobre a caracterização de morte encefálica. Brasília: Conselho Federal de Medicina; 1997.
- Meneses EA, Souza MFB, Baruzzi RM, Prado MM, Garrafa V. Análise bioética do diagnóstico de morte encefálica e da doação de órgãos em hospital público de referência do Distrito Federal. *Rev Bioética*. 2010; 18(2):397-412.
- Santos MJ, Moraes EL, Masarollo MCKB. Comunicação de más notícias: dilemas éticos frente à situação de morte encefálica. *Mundo Saúde*. 2012; 36(1):34-40.
- Associação Brasileira de Transplantes de Órgãos. Dados numéricos da doação de órgãos e transplantes realizados por estado e instituição no período de janeiro/março - 2014. *Regist Bras Transpl [Internet]* 2014 [citado 2014 set 18]. 20(1):1-21. Disponível em: <http://www.abto.org.br/abtov03/Upload/file/RBT/2014/rbt2014parc-jan-mar.pdf>
- Grossi MG, Prado LB, Souza GP, Santos JP, Bezerra AS, Marcelino CA, et al. Comparative analysis of family consent to tissue donation according to two different donation form structures. *Einstein*. 2014; 12(2):143-8.
- Macedo LC, Oliveira JA. Perfil epidemiológico dos potenciais e efetivos doadores de órgãos de campo Mourão-PR. *SaBIOS Rev Saúde Biol*. 2013; 8(3):40-8.
- Conceição MPS, Oliveira AJB, Pontes RWF. Análise dos aspectos epidemiológicos dos candidatos a doação de órgãos no Estado do Pará. *Rev Bras Clin Med*. 2013; 11(2):123-8.
- Rodrigues TB, Vasconcelos MIO, Brito MCC, Sales DS, Silva RCC, Souza AMA. Profile of potential organ donors in a reference hospital. *Rev Rene*. 2013; 14(4):713-9.
- Aguiar MIF, Araújo TOM, Cavalcante MMS, Chaves ES, Rolim ILTP. Perfil de doadores efetivos de órgãos e tecidos no estado do Ceará. *Rev Min Enferm*. 2010; 14(3):353-60.
- Silva PHNV, Lima MLC, Moreira RS, Souza WV, Cabral APS. Spatial study of mortality in motorcycle accidents in the State of Pernambuco, Northeastern Brazil. *Rev Saúde Pública*. 2011; 45(2):409-15.
- Ministério da Saúde (BR). Sistema de Informação de Mortalidade 2012. Brasília: Ministério da Saúde; 2012.
- Ministério da Saúde (BR). Decreto Nº 879, de 22 de julho de 1993. Regulamenta a Lei nº 8.489, de 18 de novembro de 1992. Dispõe sobre a retirada e o transplante de tecidos, órgãos e partes do corpo humano, com fins terapêuticos, científicos e humanitários. Brasília: Ministério da Saúde; 1993.
- Ministério da Saúde (BR). Lei Nº 10.211, de 23 de março de 2001. Altera dispositivos da Lei Nº 9.434, de 4 de fevereiro de 1997, que dispõe sobre a remoção de órgãos, tecidos e partes do corpo humano para fins de transplante e tratamento. [Internet] 2001 [citado 2014 set 18]. Disponível em: http://www.planalto.gov.br/ccivil_03/Leis/LEIS_2001/L10211.htm
- Freire ILS, Mendonça AEO, Dantas BAS, Silva MF, Gomes ATL, Torres GV. Process of organ and tissue donation for transplant: Reflections about its effectiveness. *Rev Enferm UFPE on line [Internet]* 2014 [cited 2014 Set 18]; 8(supl.1):2533-8. Available from: http://www.revista.ufpe.br/revistaenfermagem/index.php/revista/article/view/6352/pdf_5769
- Santos MJ, Massarollo MCKB. Factors that facilitate and hinder family interviews in the process of donating organs and tissues for transplantation. *Acta Paul Enferm*. 2011; 24(4):472-8.

19. Associação Brasileira de Transplantes de Órgãos. Dimensionamento dos Transplantes no Brasil e em cada estado (2006-2013). *Regist Bras Transpl* [Internet] 2013 [citado 2014 set 18]; 19(4):1-79. Disponível em: [http://www.abto.org.br/abtov03/Upload/file/RBT/2013/rbt2013-parcial\(1\).pdf](http://www.abto.org.br/abtov03/Upload/file/RBT/2013/rbt2013-parcial(1).pdf)
20. Couto MT, Pinheiro TF, Valença O, Machin R, Silva GSN, Gomes R, et al. Men in primary healthcare: discussing (in)visibility based on gender perspectives. *Interface Comun Saúde Educ*. 2010; 14(33):257-70.
21. Agnolo CMD, Freitas RA, Almeida DF, Lanjoni VP, Oliveira MLF. Morte encefálica: assistência de enfermagem. *J Bras Transpl*. 2010; 13(1):1221-80.