



Analysis of the Knowledge of Medicine Students from Mafra-SC About Brain Death and Organs Transplantation

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ABSTRACT

Introduction: Organ transplantation (OT) is a historical advance in medicine as result of the evolution of surgical techniques and immunosuppressive drugs. Brain death (BD) which is defined as the total and irreversible cessation of brain functions, closely related to OT, as these patients are potential organ donors. **Objective:** This study aims to evaluate the knowledge from Universidade do Contestado's medical students regarding brain death and organ transplantation. **Materials and methods:** This is a prospective, analytical and descriptive study, carried out with Universidade do Contestado's medical students, where questionnaires were applied to evaluate their knowledge on the addressed topic. In the research 139 students participated from the first to the ninth phase of the medical course, being 68.6 % feminine and 31.4 % masculine. Of these, 62.6 % have already participated in a class on ME and 44.6 % in a class on OT. 84.2 % of students do not feel able to make the diagnosis of BD, and about 51.8 % assess their knowledge of the research topics as regular, 38.8 % as poor and only 9.4 % assess it as being good. Still about BD, 69.8 % of the participants know its concept, but when asked about BD criteria, exams needed for its diagnosis and about the Brazilian legislation necessary for the donation to occur, the answers were divergent. In the study, 79.9 % of the participants intend to donate their organs. **Conclusion:** Most students presented knowledge around BD and OT but do not feel capable of making BD diagnosis. The study also showed that most participants would like to be organ donors.

Descriptors: Brain death; Organ transplantation; Students, Health Occupations.

Análise do Conhecimento dos Acadêmicos de Medicina de Mafra-SC Acerca da Morte Encefálica e Transplante de Órgãos

RESUMO

Introdução: O transplante de órgãos (TO) é um avanço histórico na medicina, pois é o resultado da evolução das técnicas cirúrgicas e das drogas imunossupressoras. A morte encefálica (ME), que é definida como a parada total e irreversível das funções cerebrais está intimamente relacionada aos TO, pois esses pacientes são potenciais doadores de órgãos. **Objetivo:** O presente trabalho se objetiva em avaliar o conhecimento dos acadêmicos de medicina da Universidade do Contestado, a respeito de morte encefálica e transplante de órgãos. **Materiais e métodos:** Trata-se de um estudo prospectivo, analítico e descritivo realizado com os acadêmicos de medicina da Universidade do Contestado no qual foi aplicado questionários para avaliar o conhecimento acerca do tema abordado. Na pesquisa participaram 139 acadêmicos da primeira a nona fase do curso de medicina, sendo 68,6 % do sexo feminino e 31,4 % do sexo masculino. Desses 62,6 % já participaram de alguma aula sobre ME e 44,6 % de alguma aula sobre TO. 84,2 % dos alunos não se sentem aptos a fazer o diagnóstico de ME, e cerca de 51,8 % avaliam seu conhecimento sobre os temas da pesquisa como regular, 38,8 % como ruim e apenas 9,4 % avaliam esse como sendo bom. Ainda sobre a ME 69,8 % dos participantes conhecem o seu conceito, porém quando questionados sobre critérios de ME, exames necessários para o seu diagnóstico e sobre a legislação brasileira necessária para que ocorra a doação as respostas foram divergentes. No estudo 79,9 % dos participantes têm intenção de doar seus órgãos. **Conclusão:** A maioria dos acadêmicos apresentam conhecimento sobre ME e TO porém não se sentem aptos a fazer o diagnóstico de ME. O estudo mostrou ainda que grande parte dos participantes gostariam de ser doadores de órgãos.

Descritores: Morte encefálica; Transplante de órgãos; Estudantes de Ciências da Saúde.

INTRODUCTION

In 1964, a new stage in Brazilian medicine began when the first organ transplant (OT) was performed in Brazil at the State Servers Hospital (*Hospital dos Servidores do Estado-HSE*) in Rio de Janeiro. The donor is a nine-month-old child with hydrocephalus, and the recipient is an 18-year-old young man with chronic kidney disease undergoing peritoneal dialysis treatment¹.

The term brain death (BD) emerged many years ago and was first described by Mollaret and Goullon in 1959. Brain death is the complete and irreversible loss of brain functions and the inability to remain alive without artificial support². These BD patients are potential organ donors, and therefore, it is necessary to know how to confirm this diagnosis using the criteria established by the Federal Council of Medicine in Resolution No. 2,173 of 2017, which facilitates the investigation of BD and helps physicians in determining this diagnosis³.

OT is a treatment alternative widely used in medicine to offer a better quality of life (QoL) to patients with organ failure due to a previous illness or accident⁴. According to the Brazilian Transplantation Registry (*Registro Brasileiro de Transplantes-RBT*), published by the Brazilian Association of Organ Transplantation (*Associação Brasileira de Transplante de Órgãos-ABTO*), in the last ten years, Brazil has had more than 80,000 transplants, but even so, the queues remain long, and many patients end up dying before even if they are called⁵.

So, a good understanding of the process of organ donation by the family is necessary, as they often feel apprehensive and indecisive and, therefore, are unable to decide whether or not to donate the organs of the deceased person, being the responsibility of the health professional act in this scenario to solve possible doubts that may arise and encourage the policy of organ donation⁶.

In this regard, medical education is an essential factor for improving the organ procurement rate since there is already evidence in the literature that demonstrates the insufficient knowledge of physicians on the subject⁷. Therefore, the present study aims to evaluate the knowledge of medical students from a university in Santa Catarina on the subject.

MATERIAL AND METHODS

The present is a prospective, analytical, descriptive, cross-sectional study with a quali-qualitative approach, carried out with students from the first to the fifth year of the medical course at a private college in the city of Mafra, in the state of Santa Catarina, Brazil, totaling 139 students, between October and November 2021.

Participants were invited to answer a questionnaire, voluntarily and without identification, to assess the degree of understanding of the organ transplantation process and diagnostic criteria for BD. The questionnaire was applied online through the Google Forms program and sent to all 306 students enrolled in the medical course in the second half of 2021 through an institutional email list provided by the course coordination and, therefore, addresses. Therefore, absolute numbers of the studied population are used, not being necessary to perform a sample calculation or delimit the sample.

As there was no evidence of a validated tool to analyze these parameters addressed in the study, it was necessary to adapt a questionnaire using parameters analyzed in other similar studies that have already been reported in the literature, considering basic information about knowledge in organ transplantation and the criteria for brain death diagnosis. In the questionnaire, the questions were objective and divided into three sections: first, the characterization of the academics; then, knowledge about organ donation and transplantation was evaluated; and finally, brain death.

The study began after approval by the Ethics Committee for Research with Human Beings of the Universidade do Contestado – UnC, in which the students, through the institutional email (@aluno.unc.br), received an invitation to participate in the research with the questionnaire link, visits were also carried out in the classrooms to reinforce the invitation for the academics to participate in the study. Data collection took place from 11/04/2021 to 11/19/2021. When the questionnaires were completed, they were sent directly to the sender. The student who did not respond or did not complete the questionnaire was considered a “loss”.

Inclusion criteria were all medical students at the University of Contestado duly enrolled in the second half of 2021. Exclusion criteria were students who did not fit the above criteria and did not agree to participate in the research.

The risks of this study were minimal but consisted of tiredness or discomfort when answering the questionnaire and student identification. Still, it is worth remembering that the identity of the participants was preserved, as well as the data collected in the questionnaires. The study's benefits consist of clarifying academics' knowledge about the topics covered and whether these are dealt with satisfactorily during graduation. The present is also an excellent instrument to evaluate and review the curriculum of medical schools to expand knowledge about brain death, organ donation and transplantation.

The same program in which the questionnaires were applied, called Google Forms, was used for data analysis. The collected data were added to an electronic spreadsheet, where graphs were made to visualize and analyze the results obtained.

A descriptive analysis of the studied population was carried out according to the variables under study (characterization of the academics, assessment of knowledge about brain death and its diagnosis and organ donation and transplantation) to present information through graphs to have a greater understanding of the facts they represent.

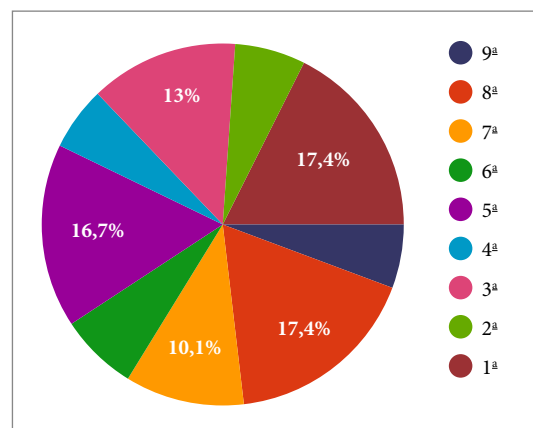
According to the Resolution of the National Health Council of the Ministry of Health nº 466/12 and Resolution nº 510/16, “all research involving human beings must be submitted to the appreciation of a Research Ethics Committee (Comitê de Ética em Pesquisa-CEP)”, therefore this research project was submitted to the Research Ethics Committee of the Universidade do Contestado by Plataforma Brasil with CAAE nº 52449721.8.0000.0117, and approved through Embodied Opinion nº 5.055.078. All participants were informed about the research objectives and the anonymity of the questionnaire through the Free and Informed Consent Form when they opted for participation, and this was signed when filling out the questionnaire.

RESULTS

Characterization of academics

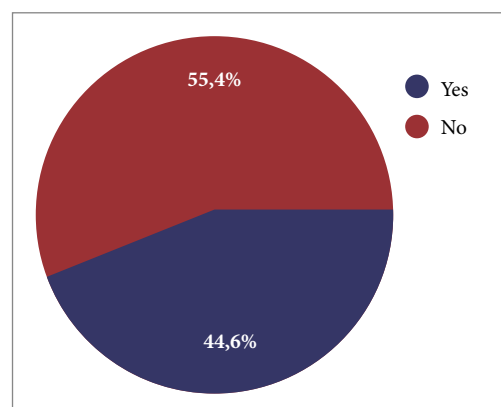
Of the 306 students enrolled in the University of Contestado (UNC) medical course in the second half of 2021, 139 (45.4%) students agreed to answer the questionnaire. The rest of the students were considered a loss, as they refused to answer the questionnaire.

Of the 139 participants, 59 (42.4%) are in the primary cycle, including students from the 1st, 2nd, 3rd and 4th phases; 71 (51%) are in the clinical cycle, which comprises the 5th, 6th, 7th and 8th phase and 8 (5.7%) are in boarding school as students of the 9th phase (Fig. 1). Of these, 44 (31.4%) are male and 94 (68.6%) are female. Over half of these never attended a class on organ transplantation and/or brain death (Fig. 2).



Source: Research data (2021).

Figure 1. Phase attended by academics.



Source: Research data (2021).

Figure 2. Number of students who have already participated in a class on organ transplantation and/or brain death.

Of the 139 participants, 117 (84.2%) did not feel able to diagnose brain death. Only 22 (15.8%) of them felt able, with 13 (9.4%) students considering their level of knowledge regarding the topics addressed as good, 72 (51.8%) students rated their level of knowledge as regular and 54 (38.8%) students classified it as poor.

Analysis of knowledge about brain death

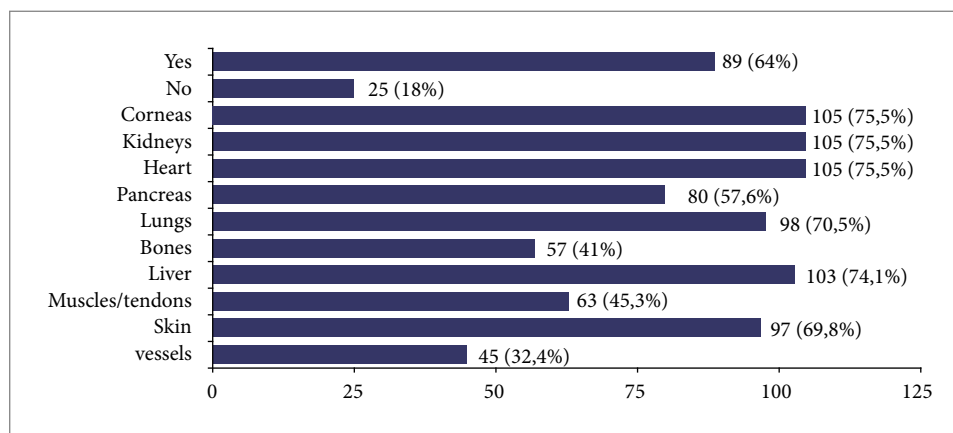
Regarding the specific knowledge questions, most students got the concept of BD right when they marked the answer that defined it as the complete and irreversible loss of brain functions. As for questions about brain death criteria in Brazil, they were asked to mark the incorrect alternative, and we can see that the answers were varied, as seen in Table 1.

Table 1. Analysis of specific knowledge about brain death and criteria for diagnosing brain death.

Questions and alternatives	No answers (%)
Concept of brain death:	
Complete and irreversible loss of brain functions	97 (69,8)
A vegetative state that causes deep coma, which only shows reflex neurological responses	28 (20,1)
Absence of wakefulness and awareness of self and environment	14 (10,1)
The patient is in cardiac arrest and a coma	0 (0)
All of the following are criteria for brain death, except:	
Treatment and observation at hospital level for at least 72 hours	40 (29)
Absence of hypothermia, hypotension or severe metabolic disturbance	57 (41,3)
Presence of brain injury of known and irreversible cause	6 (4,3)
Exclusion of exogenous intoxication or psychotropic medication effect that could confuse the diagnosis	35 (25,4)

Source: Research data (2021).

Regarding the organs that can be donated in an EM, 105 (75.5%) students selected corneas, kidneys and heart, 80 (57.6%) selected pancreas, 98 (70.5%) selected lung, 57 (41%) selected bones, 103 (74.1%) selected liver, 63 (45.3%) selected muscles, 97 (69.8%) selected skin, and 45 (32.4%) selected vessels (Fig. 3).



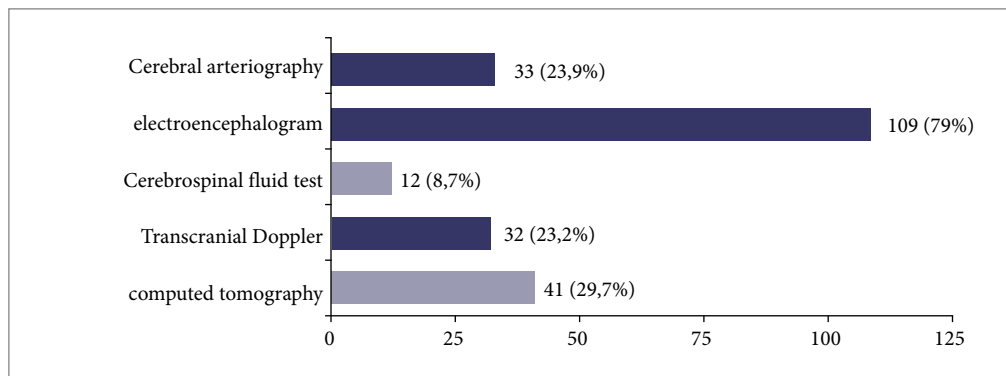
Source: Research data (2021).

Figure 3. Organs that can be donated for transplant.

Concerning which functions must be absent to declare BD, 12 (8.8%) students marked the irreversible loss of cortical function, 81 (59.6%) marked the irreversible loss of all cortical and brainstem function, 16 (11.8%) indicated that it varies according to the country’s law and 27 (19.9%) did not know how to answer.

Regarding the diagnosis of BD, 26 (18.7%) participants stated that the clinical examination must be performed by a specialist physician, a neurologist or an intensivist, 9 (6.5%) stated that the physician who will perform the diagnosis of BD brain death must be linked to the in-hospital Commission for Organ and Tissue Donation for Transplantation (CIHDOTT) and 104 (74.8%) stated that two clinical evaluations carried out by different and trained physicians with a time interval between them are necessary.

Regarding the tests used for diagnosing BD, most participants selected the electroencephalogram and computed tomography options, 79% and 29.7%, respectively, as seen in Fig. 4. Although the electroencephalogram is the most well-known method of diagnosis, computed tomography is not one of the exams used for such diagnosis.



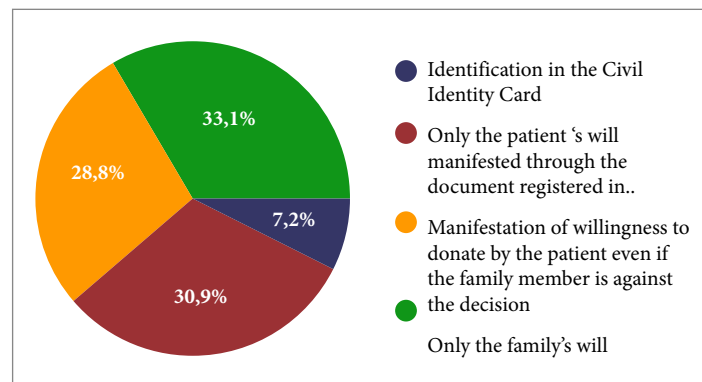
Source: Research data (2021)

Figure 4. Complementary exams for the diagnosis of brain death.

Analysis of organ donation

Regarding the intention to donate organs, 111 (79.9%) students were in favor of this and claimed to have the desire to be a donor, 5 (3.6%) had no intention of donating and 23 (16.5%) participants never thought about it.

Regarding the legislation in force in Brazil, the students were in doubt about the protocols for organ donation, being divided between whether a document registered in a notary is necessary or just the will of the family members (Fig. 5).

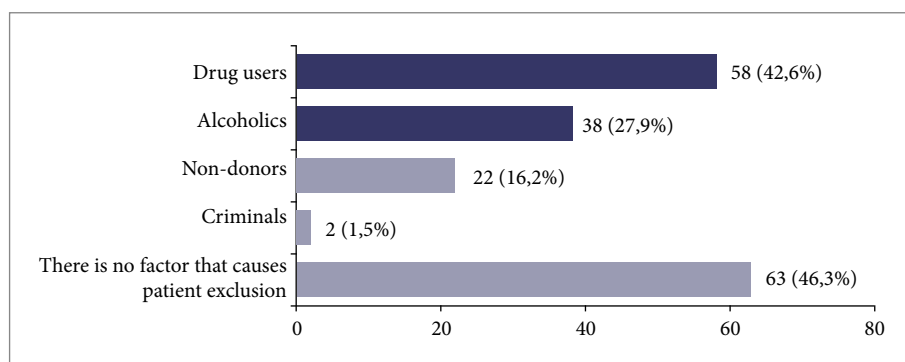


Source: Research data (2021)

Figure 5. Criteria according to Brazilian legislation for organ donation to occur.

Regarding the absolute contraindications for donation, more than half of the students correctly answered when they marked the alternatives that they indicated as contraindications: HIV infection (94.2 %), past or present neoplasia (55.4 %) and severe sepsis (66.2%). Less than half of the students got this question wrong when they answered: patients with a previous infection 44 (31.7%), patients with an earlier ischemic disease (CVA or AMI) and 18 (12.9%) obese patients.

Regarding the factors that may cause the exclusion of recipients from the transplant list, it was observed that most of the students did not know about them since the results showed that 63 (46.3%) believe that there is no factor that causes the exclusion of the patient from the transplant list (Fig. 6).



Source: Research data (2021)

Figure 6. Factors for exclusion of recipients from the list for transplants.

About the funding of transplants by the Unified Health System (*Sistema Único de Saúde-SUS*), 3 (2.2%) participants indicated that the SUS only covers living-donor transplants, 17 (12.2%) academics indicated that the SUS only covers transplants through a deceased donor and 119 (85.6%) students answered that the SUS pays live-in and deceased-donor transplants. About donation by living people, 57 (41%) participants stated that it was possible only through judicial authorization, 35 (25.2%) indicated that the lung is an example of an organ that cannot be donated by a living donor, 28 (20.1%) state that non-relatives can only be donors with judicial authorization and 19 (13.7%) indicated that the transplant is legally allowed through payment from the recipient to the donor, as long as the donor does not risk his life or compromise his health.

DISCUSSION

The results of this study showed that the average adherence rate was 45.4% of the students, which is higher than the rate of the study by Galvão *et al.*,⁸ with 32% of students from a public medical school in São Paulo (SP) and from the study by Reis *et al.*,⁵ with 42.5% of medical students at a private college in Santos (SP) who had a similar objective to this research. Regarding the gender of the research participants, we obtained the data that 68.6% are female and 31.4% are male. These data are similar to the study by Reis *et al.*,⁵ which brought 67.4% of female participants and 32.6% of male participants.

The study also demonstrated that medical students enrolled in a university in the northern plateau of Santa Catarina mostly have an intermediate basis on brain death. In contrast, the study by Reis *et al.*⁵ demonstrates that the students participating in the research had a low level of knowledge about this topic, as this was not satisfactorily addressed in the curriculum of the educational institution in question.

In the study, when asked about organ transplantation, 38.8% of the students classified this knowledge as bad, 51.8% as regular and only 9.4% as good, being able to assess that the subject of BD is more approached than the OT at the institution. Another point that reinforces this idea is that in the research, 62.6% of the participants had already had contact with some class on brain death, whether through college, course, congress or academic league. Still, on the other hand, only 44.6% of academics have already participated in a class on organ transplantation. Notably, 42.7% of respondents are studying the primary cycle, and they will still consolidate their knowledge about the subject studied since these topics are more effectively addressed in the clinical and internship cycle.

Regarding the organs that can be donated in cases of BD, 105 (75.5%) students understand that this patient can be a donor of corneas, kidneys and heart; concerning muscles and tendons, only 63 (45.3%) of the academics indicated this alternative and when asked about the possibility of donating vessels, only 45 (32.4%) academics selected this alternative. In the study by Reis *et al.*⁵ 12.84% of students selected heart and kidneys, and only 3.67% indicated blood vessels as potential tissues for donation.

Concerning the concept of brain death, 97 (69.8%) students knew the definition correctly, in contrast to a study carried out by Maia and Amorim⁹, which obtained better results, in which 90% of the medical students participating in the research were able to inform the concept of BD. This data is worrying since it represents basic knowledge about the diagnosis of BD and demonstrates that this subject should be more disseminated among students.

BD information can be disseminated throughout the population. However, health professionals must have a more significant approach since they are directly linked to the procedures that will be taken in this situation, from diagnosing death brain damage to approaching the family for possible clarifications. Therefore, future physicians must be able to diagnose BD and talk about it. In the survey, 84.2% of academics cannot diagnose brain death, while in the study by Reis *et al.*⁵, 90.3% of the students interviewed did not feel able to. In part, this is due to students' limited contact with these topics, mainly in academic practice.

In addition to clinical aspects for determining brain death, there is a legal need to perform complementary tests to establish this diagnosis. The exam to be chosen takes into account the patient's clinical situation and local availability, which may be the electroencephalogram, transcranial Doppler scintigraphy and cerebral arteriography. In the study, when asked about the tests that could be used to diagnose BD, 79% of the students selected the electroencephalogram, 23.9% the arteriography and 23.2% the transcranial doppler; however, 29.7% of the students mistakenly marked the CT scan and 8.7% the cerebrospinal fluid test. In the study by Reis *et al.*⁵, 81.95% selected electroencephalogram, 35.8% of respondents selected arteriography and 35.4% transcranial Doppler.

Organ donation requires family members to make a difficult decision, as they are going through great pain and anguish caused by the shocking news of death. Suppose there is not a good understanding of the donation process, family members may become apprehensive and indecisive because they do not have much clarification, which creates a significant problem in carrying out transplants, which is family refusal, one of the main reasons for the lack of organs made available for the transplant process. In the present study, only 33.1% of the academics selected that for organ donation to occur, the will of the family members is necessary; the other 66.9% opted for alternatives such as only the patient's will or identification of the civil identity card to be enough for the process.

Still, in the transplant process, in Brazil, the population has access to the Unified Health System (SUS), which has the most extensive public transplant program in the world since it finances 92% of the procedures performed in the country.¹⁰ Through the questionnaire applied in the study, 85.6% of the interviewees stated that the SUS pays for both live-in and deceased donor transplants.

Finally, when asked about their intention to be an organ donor, 79.9% of the participants answered that they would like to be a donor, 3.6% did not want to donate, and 16.5% never considered the subject. The values are lower than those obtained in the Galvão et al.⁸ study, where 90% of the academics intended to be organ donors. However, they were better than in the study by Dutra et al.,¹¹ in which only 69.2% had the same intention.

CONCLUSION

The results of this study show that of the medical students from Mafra-SC who answered the questionnaire, most have theoretical knowledge about brain death and organ transplantation. This data could be a result of the method of approach made available during the training course; however, when the participants were asked if they felt able to carry out the diagnosis of brain death, most of the participants answered no, emphasizing that this difficulty can be closely linked to little practical experience of the subject.

The study also showed that the vast majority of students would like to be organ donors; this is probably explained by academics' greater familiarity with transplants since the state of Santa Catarina has good rates of performing this procedure.

These data remind us that the participants are interested in the subject, so educational programs could be developed seeking greater clarification of the general population on the subject, encouraging people to express the desire to be a donor and thus resulting in better organ procurement rates for transplantation in the country. However, more studies are needed to assess the practical aspects of BD and OT and whether academics are having this contact during their graduation.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR'S CONTRIBUTION

Substantive scientific and intellectual contributions to the study: Belli AV, Kalil GKMOG; **Conception and design:** Belli AV, Kalil GKMOG; **Data analysis and interpretation:** Belli AV, Kalil GKMOG; **Article writing:** Belli AV, Kalil GKMOG; **Critical revision:** Belli AV, Kalil GKMOG; **Final approval:** Belli AV, Kalil GKMOG.

DATA AVAILABILITY STATEMENT

Data will be provided upon request.

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Not applicable.

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