**Original Article**

# Facilitators and Barriers to Donor Detection Based on Hospital Staff Opinions in Different Hospitals

Yazdan Abdolmohammadi[1], Seyed Jamalodin Tabibi[2,*] and Leila Riahi[2]

[1]Health Services Management, Science and Research Branch, Islamic Azad University, Tehran, Iran
[2]Department of Health Services Management, Science and Research Branch, Islamic Azad University, Tehran, Iran

*** Corresponding author:** Seyed Jamalodin Tabibi, Department of Health Services Management, Science and Research Branch, Islamic Azad University, Tehran, Iran. Email: sjtabibi@yahoo.com

## Abstract

**Background:** Donor detection is the first step of organ procurement for transplantation, and about 50% of all potential donors are not detected.

**Objectives:** The present study aimed to evaluate the facilitators and barriers to donor detection based on hospital characteristics and staff opinions.

**Methods:** In this cross-sectional study, a 16-item questionnaire was prepared to clarify medical staff opinions about facilitators (10 items) and barriers (6 items) to potential donor detection. The questionnaire was distributed on social networks, and all medical staff members were invited to participate in the study.

**Results:** A total of 230 medical staff participated in this study. From their point of view, the main facilitator was active detection via regular daily phone calls (150, 65.2%), which had the most advocators among medical staff of public (64.1%) and private hospitals (74.5%). Detection by donor coordinators or inspectors tanked the second (103, 44.8%). Moreover, private hospitals highly agreed with detection by donor coordinators and inspectors in 66.7% and 60.8% of cases, respectively. Donor detection by an in-hospital-coordinator was recommended by 42.6% of all 230 participants, with most advocators among those affiliated with an organization (65.4%). Staff opinions about donor selection and care to donor families were important barriers according to 53.5% and 46.1% of subjects, respectively.

**Conclusion:** To identify all potential donors, different strategies are necessary according to hospital characteristics. In public hospitals, daily calls; in private ones, active visits; and in an-organization-related hospitals, in-hospital coordinators could be effective.

*Keywords:* Barriers, Detection facilitator, Donor detection, Questionnaire, Transplantation

## 1. Background

The discovery of immunosuppressive medications, such as cyclosporine, in 1970 resulted in the improvement of graft maintenance and successful outcomes of organ transplantation (1). Subsequently, solid organ transplantation was considered the last therapeutic option for end-stage organ failure to preserve human life (2). Following improvement in this field, the number of patients on the waiting list increased rapidly while organ procurement did not follow that pattern; therefore, the new problem for the transplantation technology is organ shortage (3, 4) which causes more than 10 death per day on the waiting list (5); therefore, the achievement of a balance between demand and supply in the transplantation field is a daunting challenge.

There are some resources for organ procurement, including living donors when a living person donates an organ (or part of an organ) for transplantation (6), domino transplantations when a viable organ procured from an organ transplant recipient that is subsequently utilized in another suitable recipient for example heart donation from a recipient of heart-lung transplantation(7); heart-beating donors or brain death donors (8); non-heart-beating donors or donation after cardiac death, xenotransplantation, and tissue-engineered organs (9). Among these sources, each one has its limitations and ethical concerns. Nonetheless, brain death donors are one of the best options in terms of ischemic time and ethical considerations (4).

Donor detection is the first step in organ harvesting from brain death cases. Donor detection means finding all comatose patients with Glasgow Score Coma (GCS) of 3 in the intensive care unit (ICU) or emergency departments. These patients will be evaluated for brain death criteria. Each hospital has its legislation for cooperation with the transplant team. Given that the main source of brain death cases is the emergency room or ICU of hospitals, a multidisciplinary method for donor detection is crucial to make medical staff agree with this procedure and cover all legal, ethical, economic, social, and medical aspects of donation from brain-dead people.

In this regard, to cover concerns related to the identification and selection of potential donors, many guidelines and institutional policies have been mentioned for hospital staff. Nevertheless, the hospital staff members are responsible for translating these recommendations into daily practice. Indeed,

each hospital staff has a special point of view towards organ procurement, affecting their practice. To be more precise, an awareness of transplantation outcomes directly affects the level of cooperation. (10). Therefore, medical staff knowledge and attitude have been identified as key factors in detecting potential donors with no delay (11).

Since about half of the potential donors are not reported by hospital staff and identification and referral of potential donors are suboptimal, it is an appropriate policy to enhance the donor pool, decrease donor loss, and improve donor detection (5). Lack of strong motivation leads to lower rates of referral; accordingly, the development of a specific and proper method for each hospital to guide medical staff may increase the number of donors. Therefore, it is of utmost importance to explore healthcare providers' opinions regarding motivators and obstacles to donor detection.

Regarding ICU staff insights, the majority of studies have focused on assessing the effect of staff attitudes and views of organ donation on donation success rather than probing the facilitators and barriers to donor detection (12,13).

## 2. Objectives

The present study aimed to evaluate the facilitators and barriers to detecting potential brain-dead cases for organ donation based on hospital characteristics and staff opinions.

## 3. Methods

### 3.1. Study design and participants
Our Organ procurement unit (OPU) covers 5.7 million of Tehran's population, and the potential donors of 50 hospitals should be reported to our OPU at any time. In this electronic cross-sectional study, our target population included all medical staff of ICUs and the emergency department who were involved in the donation process. The questionnaire was distributed via WhatsApp social network on December 2021. All the supervisors of the medical staff were aware of the call to inform their team to answer the questions. We used the non-probability sampling method (Quota). Our estimated sample size was estimated at 221, based on a 50% response rate. However, the actual response rate was 60%, and 230 nurses and medical staff participated in the study.

### 3.2. Data Collection
A checklist was used to collect the data, which includes the following items: demographic data (age, gender), profession, hospital type (type I: Providing trauma and neurosurgery care, type II: With no trauma or neurosurgery care), hospital classification (affiliated to an organization, such as an Insurance or

Oil Company, Military organization, and Bank; public hospital; and private hospital), the number of organ donors cared for in the past year by the individual, the number of organ donors cared for during a professional career by the individual and their opinion about hospital performance regarding donor detection as self-assessment (based on a 3-level answer: weak, moderate, and strong).

In addition, a 16-item questionnaire was prepared using the questionnaire of Oczkowski et al. (14) for assessing the facilitators and barriers to organ donation. Facilitators are all the items that encourage medical staff to cooperate in donor detection, and barriers or obstacles are all the factors that discourage medical staff from cooperation in donor detection. In total, 10 questions measured the facilitating factors regarding donor detection and 6 items corresponding to the potential barriers. Some questions about facilitators were about coordinators (a person who is trained and involved in the donation process, including in-hospital or donor coordinators. The in-hospital coordinator resides in the hospital, whereas the donor coordinator works in the organ donation unit and sometimes will be sent to visit a potential donor) and inspector or supervisor (In the organ donation process, one person as an inspector beyond the hospital and donation team- evaluates donor detection).

The questionnaire was based on a Likert-type response scale ranging from completely disagree to completely agree; moreover, scores 4 (agree) and 5 (completely agree) were considered positive answers. After the translation of the questionnaire, content validity was assessed, and some questions regarding the content or available answers were modified. The final content validity index was more than 90% for all questions.

### 3.3. Ethical Consideration
The study was approved by the Science and Research Branch of Islamic Azad University with the reference number IR.IAU.SRB.REC.1400.399. The questionnaire was anonymous, and all participants were invited to complete the questionnaire with their consent.

### 3.4. Statistical analysis
The data were analyzed in SPSS software (version 21.0). Mean±SD and frequency (percentage) were used for variables description, while the chi-square test was utilized for data comparison. A p-value less than 0.05 was considered statistically significant.

## 4. Results

### 4.1. Participants' characteristics
The response rate was 60% and 230 nurses and medical staff with a mean age of 38.5±28 years participated in the study, out of whom 143 (62.3%)

**Table 1.** Survey Respondent Characteristics (n=230)

| Characteristics | N (%) |
|---|---|
| **Profession*** | |
| Nurse | 175 (76.1) |
| senior Nursing manager | 26 (11.2) |
| Other medical staff | 29 (12.7) |
| **Hospital Type**** | |
| Type I | 147 (63.8) |
| Type II | 83 (36.2) |
| **Hospital Services** | |
| Governmental - Public | 153 (66.5) |
| Private | 51(22.2) |
| Affiliated with an organization | 26 (11.3) |
| **Number of organ donors cared for in the past year** | |
| 0 | 62 (27) |
| 1-2 | 85 (36.7) |
| 2-5 | 45 (19.7) |
| More than 5 | 38 (16.6) |
| **Number of organ donors cared for during a professional career** | |
| Less than 5 | 121 (52.5) |
| 5-10 | 69 (29.9) |
| 10-20 | 17 (7.2) |
| More than 20 donors | 23 (10.4) |

* N=31, (13.5%) of total participants were transplant coordinators in addition to their routine tasks
** Type I hospitals: provide trauma or neurosurgery care, Type II: With no trauma or neurosurgery care

cases were female. Respondent characteristics, including hospital classification and types, are displayed in Table 1. The length of the work experience was 12.7±7.7 years for all participants, and 63.8% of them worked at the hospital with a neurosurgery department (Type I hospitals). Regarding ICU experience, there was a wide range from no experience to 200 months (median: 30 months) of working at the ICU. In other words, 77 (33.4%), 87 (37.9%), and 59 (25.7%) participants had an experience of fewer than 12 months, 1-5 years, and more than five years of working at the ICU. The length of experience was not clear in 7 (3%) of the subjects.

### 4.2. Hospital performance regarding donor detection

Medical staff opinion about hospital performance regarding donor detection is illustrated in Table 2. Most of the medical staff in type I hospitals believed that the hospital performance regarding donor detection was moderate or strong, while most of the medical staff in type II hospitals considered this performance to be weak (P<0.001). In terms of classification of hospitals, 73% of the medical staff of hospitals affiliated with an organization believed that the hospital performance regarding donor detection is moderate or strong, while this rate was 85% and

88.2%, respectively, in the medical staff working in public and private hospitals (P=0.034).

### 4.3. Facilitators and Motivations

The current study demonstrated that the main facilitator of identifying potential donors is active detection via regular daily phone calls, which were mentioned by 150 (65.2%) participants. Moreover, the availability of donor coordinators and visiting by the inspectors were other important motivations for donor detection, both of which were mentioned by 103 (44.8%) participants. Donor detection by in-hospital coordinators was stated by 98 (42.6%) medical staff (Table 3).

In public hospitals, the most recommended facilitator was donor detection by daily call (98 out of 153; 64.1%), while in private hospitals, the main facilitators were also daily call (38 of 51; 74.5%), followed by availability of donor coordinator (34 of 51; 66.7%). In the hospitals affiliated with an organization, out of 26medical staff, 17 (65.4%) cases preferred to have in-hospital coordinators (Table 4). In addition, regarding hospital types, medical staff in type I hospitals (with more probability of potential donors) preferred to have regular daily phone calls to identify potential donors (129 of 147; 87.7%). Furthermore, in type II hospitals, intermittent visits

**Table 2.** Medical staff opinion about hospital performance regarding donor detection according to the hospital characteristics

| | Hospital performance regarding donor detection | | | P value* |
|---|---|---|---|---|
| | Weak | Moderate | Strong | |
| **Hospital Type*** | | | | |
| Type I | 20 (13.6%) | 75 (51.0%) | 52 (35.4%) | <0.001 |
| Type II | 45 (54.2%) | 20 (24.1%) | 18 (21.7%) | |
| **Hospital Services** | | | | |
| Governmental - Public | 7 (26.9%) | 9 (34.6%) | 10 (38.5%) | |
| Private | 23 (15.0%) | 52 (34.0%) | 78 (51.0%) | 0.034 |
| Affiliated with an organization | 6 (11.8%) | 17 (33.3%) | 28 (54.9%) | |

* Chi-square test

**Table 3.** Facilitators (Items that help the process of referral of potential donors to an OPU) according to the viewpoint of medical staff

| Item | N (%) |
|---|---|
| Regular daily phone calls to identify potential donors | 150 (65.2) |
| Availability of donor coordinator | 103 (44.8) |
| Intermittent visits to the ward by the inspector | 103 (44.8) |
| Donor detection by in-hospital-coordinator | 98 (42.6) |
| Hospital support for donor detection | 60 (26.1) |
| Availability of a worksheet for donor detection and scheduled notification policy | 51 (22.2) |
| Staff in-services and education on donor detection | 50 (21.7) |
| Staff culture is supportive of donor detection | 50 (21.7) |
| Availability of a poster for donor detection to remind staff | 33 (14.3) |
| Family requests for referral to an OPU | 24 (10.4) |

OPU: Organ procurement unit

**Table 4.** Comparison of facilitators of donor detection from the viewpoint of medical staff in hospital classification and type

| | Hospital Classification | | | | Hospital Type | | |
|---|---|---|---|---|---|---|---|
| | Public (n=153) | Affiliated with an organization (n=26) | private (n=51) | P-value* | Type I (n=147) | Type II (n=83) | P-value* |
| Donor detection by in-hospital-coordinator | 67 (43.8) | 17(65.4) | 14 (27.5) | 0.056 | 63 (42.9) | 35 (42.2) | 0.825 |
| Regular daily phone calls to identify potential donors | 98 (64.1) | 14 (53.8) | 38(74.5) | 0.353 | 129(87.7) | 21 (25.3) | 0.034 |
| Availability of donor coordinator | 65(42.5) | 4 (15.4) | 34(66.7) | 0.017 | 67 (45.6) | 36 (43.3) | 0.586 |
| Intermittent visits to the ward by the inspector | 64 (41.8) | 8 (30.8) | 31 (60.8) | 0.039 | 66 (44.9) | 37 (44.6) | 0.789 |
| Availability of a worksheet for donor detection and scheduled notification policy | 29 (18.9) | 10 (38.5) | 12 (23.5) | 0.130 | 42 (28.6) | 9 (10.8) | 0.436 |
| Availability of a poster for donor detection to remind staff | 17 (11.11) | 7 (26.9) | 9 (17.64) | 0.075 | 15 (10.2) | 18 (21.7) | 0.018 |
| Hospital support for donor detection | 45 (29.4) | 4 (15.4) | 11 (21.6) | 0.174 | 38 (25.9) | 22 (26.5) | 0.904 |
| Family requests for referral to an OPU | 17 (11.11) | 3(11.5) | 4 (7.8) | 0.566 | 13 (8.8) | 11 (13.3) | 0.302 |
| Staff in-services and education on donor detection | 36 (23.5) | 6(23.1) | 8(15.7) | 0.176 | 29 (19.7) | 21 (25.3) | 0.453 |
| Staff culture is supportive of donor detection | 34(22.2) | 11 (42.3) | 5(9.8) | 0.194 | 32 (21.8) | 18(21.7) | 0.779 |

* Chi-square test
Data presented as N (%).
Type I hospitals: provide trauma or neurosurgery care, Type II: With no trauma or neurosurgery care
OPU: Organ procurement unit

to the ward by the inspector were more acceptable than other methods and mentioned by 37 out of 83 (44.6%) (Table 4).

### 4.4. Barriers and Obstacles

In terms of barriers to successful donor detection, it was revealed that staff viewpoints of donor selection affected the donor referral to the OPU (123, 53.5%), and According to some medical staff, potential donor identification is not done because the family may be disturbed (106, 46.1%). Moreover, concerns about patient care were another notable obstacle (97, 42.2 %) (Table 5). The most important barrier in public hospitals was their knowledge to select a suitable donor, and it was mentioned in 72 out of 153 (47%). In the hospitals affiliated with an organization, the most important barrier was unapproved and unclear criteria for donor detection, as stated by 16 out of 26 (61.5%) medical staff. In private hospitals, lack of knowledge was an important barrier for potential donor detection that

**Table 5.** Barriers (items that avoid the process of referral of potential donors to an OPU) according to the viewpoint of medical staff

| Item | N (%) |
|---|---|
| Staff deciding for themselves that a potential donor is inappropriate for donation | 123 (53.5) |
| Staff believe that referral to the OPU may be distressing to the donor family | 106 (46.1) |
| Staff believe that referral to the OPU will affect patient care | 97 (42.2) |
| Unclear criteria for potential donor referral to the OPU | 81 (35.2) |
| The referral process to OPU is a time-consuming task | 61 (26.5) |
| Lack of individual responsibility for referring potential donors | 47 (20.4) |

OPU: Organ procurement unit

**Table 6.** Comparison of barriers to donor detection from the viewpoint of medical staff in hospital classification and type

| | Hospital Classification | | | | Hospital Type | | |
|---|---|---|---|---|---|---|---|
| | Public (n=153) | Affiliated with an organization (n=26) | private (n=51) | P-value* | Type I (n=147) | Type II (n=83) | P-value* |
| Unclear criteria for potential donor referral to the OPU | 49 (32) | 16 (61.5) | 16 (31.4) | 0.042 | 50 (34) | 31 (37.3) | 0.563 |
| Staff believe that referral to the OPU will affect patient care | 60 (39.2) | 8 (30.8) | 29 (56.9) | 0.029 | 60 (40.8) | 37 (44.6) | 0.608 |
| Staff believe that referral to the OPU may be distressing to the donor family | 64 (41.8) | 10 (38.5) | 32 (62.7) | 0.017 | 68 (46.2) | 38 (45.8) | 0.908 |
| Staff deciding for themselves that a potential donor is inappropriate for donation | 72 (47) | 13 (50) | 38 (74.5) | 0.002 | 79 (53.7) | 44 (53) | 0.637 |
| The referral process to OPU is a time-consuming task | 42 (27.5) | 6 (23.1) | 13 (25.5) | 0.778 | 39 (26.5) | 22 (26.5) | 0.973 |
| Lack of individual responsibility for referring potential donors | 29 (19) | 5 (19.2) | 13 (25.5) | 0.310 | 25 (17) | 22 (26.5) | 0.091 |

* Chi-square test
Data presented as N (%).
Type I hospitals: provide trauma or neurosurgery care, Type II: With no trauma or neurosurgery care
OPU: Organ procurement unit

was mentioned by 74.5%of cases. Moreover, in private hospitals, concern about the donor family was another considerable point. Regarding types of hospitals, there were no differences in the main barrier, and most of the medical staff informed the transplant team according to their judgment (Table 6).

## 5. Discussion

The present study determined both facilitators and barriers to donor detection in different hospitals. The most important motivators for donor detection were regular phone calls to medical staff and active detection by a donor coordinator or supervisor. Moreover, the main barriers were donor selection by medical staff according to their discretion, concerns about the donor family, and disruption of the patient's care. In public hospitals, the most recommended factor was donor detection by daily calls, while in private hospitals, in addition to daily calls, the availability of a donor coordinator or supervisor was an important factor, according to medical staff opinions. In addition, in hospitals affiliated with an organization, the in-hospital coordinator was highly recommended. Regarding hospital types, in hospitals with neurosurgery care, apart from daily calls, the available donor coordinator was notable and intermittent visits to the ward by the inspector were considerably mentioned by medical staff.

To identify all potential donors, healthcare staff must be able to assess the clinical feature of unconscious patients and refer them to the OPU. In this regard, to refer an organ donor, neurological condition, medical status, cardiorespiratory response, and administrative criteria should be evaluated. Therefore, it may be considered that potential donor detection is a time-consuming process, and medical staff may ignore this task. In all types of hospitals, daily contact is an effective strategy for donor detection, and the donor coordinator has a crucial role to play in reducing the workload of hospital staff.

In Iran, each OPU employs special methods to improve the detection process. In our OPU, we used three different methods to detect all potential donors, including scheduled contact every 12 hours with all emergency departments and ICUs. Moreover, we had some unscheduled visits to detect any possibly missed potential donors. Nonetheless, some in-hospital coordinators are trained in each hospital to refer all patients with loss-of-consciousness conditions for further evaluation.

According to Beige et al., more active strategies for the detection of brain death cases significantly improve the donor pool (15). Trilikauskiene et al. reported that a computerized scale to search actively for potential donors was also an effective strategy (5). The other technique advocated by Zier et al. (16) was an electronic clinical decision-supporting approach which increased the potential donor detection from 12%-46%. Indeed, they implemented this system to automatically inform organ procurement organizations of patients meeting clinical conditions indicating brain death.

As the first step of the organ donation process, in general, potential donors are detected in hospitals; however, there is no standard definition of a potential donor. In the study conducted by Bleakley et al., it was clarified that the donation rate was 7.4% out of all potential donors. Indeed, 92.6% of the detected cases were not in brain-dead condition or were a part of the donor loss (17). Nevertheless, Trilikauskien et al. reported that 14.5% of possible donors became potential donors, and these discrepancies can be ascribed to different criteria for determining potential donors (5).

It is worth noting that there is a high mortality rate of 70% among patients with GCS 7 or less, and 43% occurred due to brain death (18). Therefore, to cover all potential donors, we recommend assessing

and following all of these issues in further visits. Given that donor detection is a part of the daily practice of all OPUs, up to 50% of all potential donors still might not be detected (19). Accordingly, when donor detection is the key step in organ transplantation, various strategies, including online communication tools, education, new technology, such as virtual reality, a customized and self-sustaining training program, specialist nurse in organ donation, online training program, and an instant messaging application have been utilized (20). However, medical staff must translate any strategy into a successful approach for donor detection.

To the best of our knowledge, hospital characteristics are not discussed for facilitators and barriers, and in this study, we indicated that each kind of hospital has its own considerations. As it was clarified, in hospitals that are affiliated with an organization, regulations and clear criteria are of paramount importance. The staff of private hospitals prefers to have a detection supervisor, maybe due to physicians' tendency to continue the patients' care despite brain death situations.

Our study has some limitations based on the questionnaire distribution and study population. Indeed, external generalization was affected due to non-probably sampling. All study subjects were not in the same situation, which may affect the answers. Furthermore, we had some missing data, and due to an online-based questionnaire, we had no opportunity to encourage the target population to participate. However, this study has presented an overview for further planning.

## 6. Conclusion

To identify all potential donors, different strategies are necessary according to hospital characteristics. In public hospitals, daily calls; in private hospitals, a daily visit by a supervisor; and in hospitals affiliated with an organization, approved guidelines could be effective in improving donor detection. We recommend overcoming the determined barriers through some training courses regarding organ donation and transplantation. Furthermore, it is necessary to create a positive attitude to cover the lack of responsibility and clarify the donation process to reduce concerns about the patient's care and the donor's family.

## Acknowledgments

## Footnotes

**Conflicts of Interest:** None

**Funding/Support:** None
**Ethical Statements:** IR.IAU.SRB.REC.1400.399.

## References

1. Pillai AA, Levitsky J. Overview of immunosuppression in liver transplantation. World *J Gastroenterol*. 2009;**15**(34):4225. doi: 10.3748/wjg.15.4225. [PubMed: 19750565].
2. Lewis A, Koukoura A, Tsianos GI, Gargavanis AA, Nielsen AA, Vassiliadis E. Organ donation in the US and Europe: The supply vs demand imbalance. *Transplant Rev.* 2021;**35**(2):100585. doi: 10.1016/j.trre.2020.100585. [PubMed: 33071161].
3. Najafizadeh K, Ghorbani F, Rostami A, Fard-Mousavi A, Lorgard-Dezfuli-Nejad M, Marashian M, et al. Depression while on the lung transplantation waiting list. *Ann Transpl*. 2009;**14**(2):34–7. [PubMed: 19487792].
4. Michael A. History of brain death as death: 1968 to the present. *J Crit Care.* 2014;**29**(4):673–8. doi: 10.1016/j.jcrc.2014.04.015. [PubMed: 24930367].
5. Trilikauskienė A, Maraulaitė I, Damanskytė D, Lukminaitė D, Balčiūnienė N, Tamošuitis T. Implementing of active brain-dead donor detection strategy in a single donor center: one year experience. *Medicine.* 2020;**56**(8):1-9. doi: 10.3390/medicina56080366. [PubMed: 32707964].
6. Lopez-Soler RI, Garcia-Roca R, Lee DD. Disparities in living donation. *Curr Opin Organ Transplant*. 2021;**26**(5):542–6. doi: 10.1097/MOT.0000000000000912. [PubMed: 34375319].
7. Maynes EJ, O'Malley TJ, Austin MA, Deb AK, Choi JH, Weber MP, et al. Domino heart transplant following heart-lung transplantation: a systematic review and meta-analysis. *Ann Cardiothorac Surg*. 2020;**9**(1):20-8. doi: 10.21037/acs.2019.12.02. [PubMed: 32175236].
8. Najafizadeh K, Abbasi A, Ghorbani F, Radpei B, Kashani BS, Ahmadi ZH, et al. Organ retrieval from brain-dead patients by a single organ procurement center in Iran. In: Transplantation proceedings. Elsevier; 2009.
9. Akbarzadeh A, Khorramirouz R, Ghorbani F, Beigi RSH, Hashemi J, Kajbafzadeh A-M. Preparation and characterization of human size whole heart for organ engineering: scaffold microangiographic imaging. *Regen Med.* 2019;**14**(10):939–54. doi: 10.2217/rme-2018-0111.
10. Abdolmohammadi Y, Nabi M, Mostafavi K, Dezful MM, Nejatollahi SMR, Ghorbani F. Hospital Characteristics and Nursing Attitude toward Organ Donation. *Iran Red Crescent Med J.* 2022;**24**(3):e1589.
11. Takahashi K, Wakasugi M, Okudera H, Seto C, Furuki I, Hasegawa T, et al. Importance of continuing education for medical staff to improve the confirmation rate of intent for organ donation. In: Transplantation proceedings. Elsevier; 2019.
12. Ju MK, Sim MK, Son SY. A Study on Nursing Students' Knowledge, Attitude, and educational needs for brain-death organ transplantation and donation and intent to donate organs. *Transplant Proc.* 2018;**50**(4):1187–91. doi: 10.1016/j.transproceed.2018.02.036. [PubMed: 29731091].
13. Lomero M del M, Jiménez-Herrera MF, Rasero MJ, Sandiumenge A. Nurses' attitudes and knowledge regarding organ and tissue donation and transplantation in a provincial hospital: A descriptive and multivariate analysis. *Nurs Heal Sci.* 2017;**19**(3):322–30. doi: 10.1111/nhs.12348. [PubMed: 28631279].
14. Oczkowski SJW, Durepos P, Centofanti J, Arsenau E, Dhanani S, Cook DJ, et al. A Multidisciplinary survey to assess facilitators and barriers to successful organ donation in the intensive care unit. *Prog Transplant.* 2019;**29**(2):179–84. doi: 10.1177/1526924819835826. [PubMed: 30895847].
15. Beige FS, Mohsenzadeh M, Shahryari S, Mojtabaee M. Role of more active identification of brain-dead cases in increasing organ donation. *Exp Clin Transpl.* 2017;**15**(1):60–2. doi: 10.6002/ect.mesot2016.042. [PubMed: 28260435].
16. Zier JL, Spaulding AB, Finch M, Verschaetse T, Tarrago R. Improved time to notification of impending brain death and

increased organ donation using an electronic clinical decision support system. *Am J Transplant*. 2017;**17**(8):2186–91. doi: 10.1111/ajt.14312. [PubMed: 28397363].

17. Bleakley G. Implementing minimum notification criteria for organ donation in an acute hospital's critical care units. *Nurs Crit Care*. 2010;**15**(4):185–91. doi: 10.1111/j.1478-5153.2009.00385.x. [PubMed: 20626795].

18. Bustos JL, Surt K, Soratti C. Glasgow coma scale 7 or less surveillance program for brain death identification in Argentina: Epidemiology and outcome. In: Transplantation proceedings. Elsevier; 2006.

19. Trilikauskienė, A., Maraulaitė, I., Damanskytė, D., Lukminaitė, D., Balčiūnienė, N., & Tamošuitis, T. Implementing of active brain-dead donor identification strategy in a single donor center: one year experience. Medicina, 2020; **56**(8), 366. doi: 10.3390/medicina56080366

20. Witjes M, Jansen NE, van der Hoeven JG, Abdo WF. Interventions aimed at healthcare professionals to increase the number of organ donors : a systematic review. *Crit Care*. 2019;**23**(1):1-19. doi: 10.1186/s13054-019-2509-3. [PubMed: 31221214].