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Assessment of resident and fellow knowledge of the organ donor referral process

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Abstract

Maximizing deceased donation rates can decrease the organ shortage. Non-transplant physicians play a critical role in facilitating conversion of potential deceased donors to actual donors, but studies suggest that physicians lack knowledge about the organ donation process. Since residency and fellowship are often the last opportunities for formal medical training, we hypothesized that deficiencies in knowledge might originate in residency and fellowship. We conducted a cross-sectional survey to assess knowledge about organ donation, experience in donor conversion, and opinions of the process among residents and fellows after their intensive care unit rotations at the Johns Hopkins Hospital. Of 40 participants, 50% had previously facilitated donor conversion, 25% were familiar with the guidelines of the Organ Procurement Organization (OPO), and 10% had received formal instruction from the OPO. The median score on the knowledge assessment was 5 out of 10; higher knowledge score was not associated with level of medical training, prior training in or experience with donor conversion, or with favorable opinions about the OPO. We identified a pervasive deficit in knowledge among residents and fellows at an academic medical center with an active transplant program that may help explain attending-level deficits in knowledge about the organ donation process.

Keywords

organ donation; brain death; health knowledge; attitudes; practice; attitude of health personnel; tissue and organ procurement

INTRODUCTION

Consent rates, defined as the proportion of agreements to donate among requests for deceased donation, by families of potential brain dead donors are estimated to be

approximately 70% or less in the United States (1). Consent is a critical component of deceased donor conversion, defined as actual donation among potential donors. Maximizing the conversion of eligible deceased patients could attenuate the profound organ shortage (2-5). Failure to identify potential organ donors, failure to discuss organ donation with families (6), and a low consent rate after organ donation is discussed (7-9) contribute to suboptimal deceased donation rates. While the organ procurement organization (OPO) is primarily responsible for approaching families about organ donation, medical personnel engaged in patient care can facilitate donation, even without directly raising the option of donation with the family, by confidently answering questions about donation and transplantation. This is more likely to occur effectively if medical personnel are more knowledgeable about the medical criteria for organ donation, more aware of the donor conversion process, and more educated about transplantation in general (10, 11). The Spanish model of achieving high donation rates through specifically trained physician transplant coordinators in all donor-eligible hospitals exemplifies this concept, with a consent rate for organ donation from deceased donors of 83.6% (12-14).

Therefore, a proper understanding of brain death and the donor conversion process among health professionals seems paramount. While there is a clear separation between patient care and the deceased donor organ procurement process, non-transplant physicians, particularly intensivists (15), often play an integral role in facilitating the process of donor conversion because of their direct involvement in the care of the patient and, hence, their intimate relationship with the patient's family. They can also help the OPO coordinator understand the potential donor's medical situation, the family dynamic, and the timing of medical care to facilitate sensitive and appropriate discussions about donation with the family.

However, while attending physicians generally have favorable opinions toward organ transplantation (16-18), they lack knowledge about basic organ transplantation and procurement topics, such as the criteria for establishing brain death (16), other medical criteria for deceased donor organ donation (10, 19), and the laws and regulations governing organ donation (11). Since residency and fellowship are often the last point in physician training during which skills and habits can be formally inculcated, we hypothesized that the lack of knowledge in organ transplantation topics among attending physicians might originate as a lack of knowledge among residents and fellows.

We were unable to identify any studies of transplant knowledge specific to residents and fellows in the United States. Therefore, the objectives of this study were (1) to determine the transplant knowledge base of surgery and medicine residents and fellows who had rotated through the intensive care units (ICUs) at the Johns Hopkins Hospital (JHH), (2) to assess their training in and experiences with caring for a potential organ donor and the donor conversion process, (3) to assess their opinions of the donor conversion process, and (4) to determine the association of training and opinions with transplant knowledge.

METHODS

Survey Design

The study was reviewed and approved by the Johns Hopkins Institutional Review Board. Survey instrument development was based on a literature review and formative interviews with a transplant surgeon, the OPO Director of Professional Education, and five surgical residents. Pilot testing involved a member of the transplant surgery faculty, four surgical residents, and five transplant research staff. The resulting survey consisted of subjective questions regarding participant level of training, prior experiences in organ donor conversion, awareness and familiarity with OPO guidelines, and opinions of the organ donation process. The survey also contained a knowledge assessment that included questions about brain death, organ allocation and donor criteria, and policy.

Source Population

We approached 127 trainees at JHH, including surgical residents who had rotated in the surgical ICU (SICU) during Post-Graduate Year 2 (PGY-2), internal medicine residents who had completed ICU training during PGY-1 and PGY-3, SICU critical care fellows, and pulmonary critical care fellows in the medical ICU (MICU).

Survey Administration

We administered our survey during June 2011, the last month of the 2010-2011 academic year, after participants had completed at least one ICU rotation. The email addresses of the 127 residents and fellows were obtained from their training program directors, and links to an anonymous survey were distributed by email with periodic reminders throughout the study month.

Statistical Analysis

Univariate comparisons between knowledge scores, specialty, level of training, prior experiences in organ donor conversion, awareness and familiarity with OPO guidelines, and opinions of the organ donation process were performed using Hodges-Lehmann's test for equal medians for non-normally distributed continuous variables and Fisher's exact tests for categorical variables. The knowledge score was defined as the number correct out of 10 questions, and a high knowledge score was empirically defined as correctly answering 5 questions (the median score). Univariate generalized linear models (GLMs) were used to estimate the independent associations between high knowledge score and trainee characteristics and opinions. To obtain estimates of relative risks of outcome, a GLM was used to fit a Poisson model with robust variance estimation, as previously described (20). All analyses were performed using STATA 12.0/MP for Linux.

RESULTS

Study Population

Of 40 trainees who participated in the survey (31.5% response rate), 23 were residents (8 surgery PGY-2 residents, 9 medicine PGY-1 residents, 6 medicine PGY-3 residents) and 17

were fellows (3 SICU fellows and 14 MICU fellows); 22.5% and 32.5% of participants had surgery/anesthesia or critical care career plans, respectively (Table 1).

Subjective Questions

Overall, 50% of participants had previously facilitated deceased donor conversion, 57.5% were aware that any set of guidelines for caring for a potential organ donor existed, 25% were familiar with the OPO's guidelines for caring for a potential organ donor, and only 10% reported having received formal instruction from an OPO about brain death criteria or caring for a potential organ donor (Table 1). Furthermore, 70% believed that the OPO has the primary responsibility for speaking with the family of a deceased potential organ donor about organ donation, and 50% agreed that the 24 hour presence of the OPO in the ICU is beneficial. While 42.5% agreed that the Living Legacy Foundation (LLF)'s recommendations on caring for potential organ donors are effective, only 27.5% agreed that OPO practices are effective at maximizing organ procurement. Furthermore, only 25% agreed that they had enough time to effectively practice OPO recommendations for organ donor referral and transition to the OPO in their critical care training.

Knowledge Questions

Overall, the median knowledge score was 5 out of 10 (IQR 4-6), with no detectable difference between the median knowledge score of residents and fellows (5 IQR 5-6 vs. 5 IQR 4-6, $p=0.8$).

Brain Death Questions—When asked about conditions that could interfere with brain death diagnosis, 34/40 participants (18/23 residents and 16/17 fellows, $p=0.2$) correctly answered severe facial trauma, preexisting pupillary abnormalities, toxic levels of a sedative drug, and sleep apnea or severe pulmonary disease resulting in chronic retention of carbon dioxide (Question 1). When asked if magnetic resonance imaging (MRI), positron emission tomography (PET) scan, or computed tomography (CT) angiogram could be used as an alternative to bedside brain death examination, only 9/40 (3/23 residents and 6/17 fellows, $p=0.1$) chose CT angiogram correctly (Question 2). The most common wrong answer among residents was PET scan, and the most common wrong answer among fellows was MRI. When asked for the expected brain death response to the cold caloric test, 14/40 (8/23 residents and 6/17 fellows, $p=1.0$) correctly answered that no nystagmus bilaterally would be observed (Question 4). The most common wrong answer among both residents and fellows was that the eyes would move toward the contralateral ear. When asked whether or not a brain dead individual could exhibit spontaneous spinal movement of limbs, 37/40 (22/23 residents and 15/17 fellows, $p=0.6$) correctly answered that this was possible (Question 6).

Organ Allocation and Donor Criteria Questions—When asked about the primary criteria by which deceased donor kidneys are allocated, 19/40 (13/23 residents and 6/17 fellows, $p=0.2$) correctly chose time on the waiting list (Question 3). The most common wrong answer among both residents and fellows was to optimize post-transplant outcomes. When asked about absolute contraindications to organ donation, 17/40 (11/23 residents and 6/17 fellows, $p=0.5$) correctly answered HIV/AIDS (Question 5). The most common wrong

answer among both residents and fellows was that a history of cancer was an absolute contraindication to organ donation. When asked about transplanting a deceased donor kidney positive for renal cell carcinoma, 10/40 (6/23 residents and 4/17 fellows, $p=1.0$) correctly answered that this could be possible in some cases (Question 8).

Policy Questions—When asked whether or not the OPO must be informed in the case of a potential organ donor, 37/40 participants (22/23 residents and 15/17 fellows, $p=0.6$) correctly answered yes (Question 7). When asked what “first-person” consent for registered organ donors meant, 21/40 (9/23 residents and 12/17 fellows, $p=0.06$) correctly answered that a registered designation to donate organs is supposed to be honored in all cases, even if the next of kin disagrees (Question 9). The most common wrong answer among both residents and fellows was that “first-person” consent for registered organ donors meant that the organ donor has the right to choose the fate of his/her organs up until time of death, at which point the next of kin has the right to choose. When asked about the proper action to take after performing a brain death exam, finding a patient to be brain dead, and pronouncing the time of death, only 8/40 (8/23 residents and 0/17 fellows, $p=0.01$) correctly chose to allow the family time to process the diagnosis of brain death before discussing organ donation (Question 10). The most common wrong answer among both residents and fellows was to have the OPO begin discussing the option of their loved one being an organ donor with the family as soon as possible.

Factors Associated with High Knowledge Score

High knowledge score was not associated with participants’ level of training, career plans, previous facilitation of donor conversion, awareness of guidelines regarding caring for a potential organ donor, formal instruction from an OPO, and agreement with the role, recommendations, or effectiveness of the OPO (Table 3). However, individuals who agreed that the 24 hour presence of the OPO in the ICU is beneficial had significantly lower knowledge scores ($p=0.01$) (Table 3).

DISCUSSION

In this cross-sectional survey of residents and fellows at a university hospital with a high-volume transplant center and strong teaching reputation, we found significant deficits in knowledge about solid organ transplantation and the donor process. Furthermore, although half of participants had previously facilitated deceased donor conversion and the majority were aware that guidelines for caring for potential organ donors exist, few were specifically familiar with the OPO’s guidelines for caring for these patients, and very few reported receiving formal instruction from an OPO about brain death criteria or caring for a potential organ donor.

Our study extends evidence of low knowledge about organ transplantation topics among healthcare professionals (10, 11, 16, 19) to medical trainees, identifying a potential root cause for these knowledge deficits. Furthermore, knowledge of organ transplantation topics was not significantly associated with one’s level of training, career plans, prior experience in organ donor conversion, or familiarity with or formal instruction in the OPO’s guidelines. In

other words, this pervasive deficit does not appear to be addressed by the current curriculum and guidelines of either the OPO or the academic institution.

Our findings are important because non-transplant physicians play a critical role in facilitating the organ donation process: they often care for potential organ donors in the hospital setting (until death has been declared), determine when death is imminent, confirm brain death, and notify organ procurement professionals to assess the potential for organ donation. Although we cannot make causal inferences from our cross-sectional study design, we hypothesize that better education at the trainee level will result in better education at the attending physician level, more engagement in facilitating organ donation, more knowledgeable and appropriate responses to patient and family questions about donation and transplantation, and ultimately higher donor conversion rates.

Previous studies have demonstrated increased clinician knowledge about organ donation (21) and increased family consent rates (22) after physician-oriented educational interventions, likely because these clinicians are at the bedside to answer clinical questions about transplantation. However, our results indicate that the current educational curriculum is likely insufficient. Therefore, our findings highlight an area for further research, as well as the need for more targeted educational interventions in organ transplantation for residents and fellows.

This study has several limitations. Firstly, the survey was conducted at a single, tertiary-care, academic medical center. However, JHH is one of two institutions in an OPO and is a large-volume academic transplant center with formal ICU training programs; therefore, knowledge deficits identified here are particularly notable. The survey response rate of 31.5% lends this study susceptible to responder bias. However, since residents and fellows who were more comfortable with organ donation topics might be more likely to complete the survey, it is likely that any responder bias would actually result in an overestimation of knowledge. Finally, some consider decoupling (Question 10) to be controversial (23, 24).

In summary, we have identified a lack of familiarity with the OPO guidelines and a pervasive deficit in knowledge about organ donation and the donor conversion process among residents and fellows at an academic medical center. Our results contribute evidence to the argument that physicians need more education regarding neurologic and cardiac criteria for determining death, the methods for determining a potential death, and the important role that OPO professionals play in our healthcare system. Educational interventions that target residents and fellows have the potential to increase understanding of the organ donation process among the next generation of attending physicians and ultimately increase organ donor conversion rates in the critical care setting.

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Table 1

Trainee Characteristics, by Level of Training

Subjective Question, n (%)	Overall n=40	Resident n=23 (57.5)	Fellow n=17 (42.5)	P-Value
Future career plans				<0.001
Medicine/other	18 (45.0)	15 (65.2)	3 (17.7)	
Surgery/anesthesia	9 (22.5)	8 (34.8)	1 (5.9)	
Critical care	13 (32.5)	0 (0.0)	13 (76.5)	
Previously facilitated deceased donor conversion	20 (50.0)	6 (26.1)	14 (82.4)	0.001
Aware that any guidelines for caring for a potential organ donor exist	23 (57.5)	11 (47.8)	12 (70.6)	0.2
Familiar with the OPO's guidelines for caring for a potential organ donor	10 (25.0)	3 (13.0)	7 (41.2)	0.07
Received formal instruction from an OPO about brain death criteria or caring for a potential organ donor	4 (10.0)	2 (8.7)	2 (11.8)	1.0
Believes the following has the primary responsibility for speaking about organ donation with the family of a deceased potential organ donor ¹				0.5
The OPO	28 (70.0)	15 (65.2)	13 (76.5)	
The health care provider	12 (30.0)	8 (34.8)	4 (23.5)	
In my critical care training, I have time to effectively practice OPO recommendations for organ donor referral and transition to the OPO (agree)	10 (25.0)	4 (17.4)	6 (35.3)	0.3
The 24 hour presence of the OPO in the intensive care unit is beneficial (agree)	20 (50.0)	8 (34.8)	12 (70.6)	0.05
I believe the Living Legacy Foundation's recommendations to care for potential organ donors are effective	17 (42.5)	8 (34.8)	9 (52.9)	0.3
OPO practices are effective at maximizing organ procurement	11 (27.5)	5 (21.7)	6 (35.3)	0.5

OPO=Organ Procurement Organization

¹ Although also options, no participants selected nursing staff or transplant surgeon as answer choices for this question

Table 2

Knowledge of Organ Donation Assessment, by Level of Training

Knowledge Question, n (%)	Overall ^I n=40	Resident ^I n=23	Fellow ^I n=17	P-Value
1) Aware of the various conditions that can interfere with the bedside brain death examination	34 (85.0)	18 (78.3)	16 (94.1)	0.2
2) Aware that CT angiogram is an alternative method to establish brain death	9 (22.5)	3 (13.0)	6 (35.3)	0.1
3) Aware that a patient's time on the waiting list is the primary criteria by which deceased donor kidneys are allocated for transplantation	19 (47.5)	13 (56.5)	6 (35.3)	0.2
4) Aware that a brain dead individual exhibits no response to the cold caloric test	14 (35.0)	8 (34.8)	6 (35.3)	1.0
5) Aware that HIV/AIDS is an absolute contraindication to organ donation	17 (42.5)	11 (47.8)	6 (35.3)	0.5
6) Aware that a brain dead person may exhibit spontaneous spinal movement of limbs	37 (92.5)	22 (95.7)	15 (88.2)	0.6
7) Aware that the OPO must be informed in the case of a potential organ donor	37 (92.5)	22 (95.7)	15 (88.2)	0.6
8) Aware that a kidney positive for renal cell carcinoma can, in some cases, be transplanted	10 (25.0)	6 (26.1)	4 (23.5)	1.0
9) Aware that first person consent for registered organ donors means an organ donor's designation of "Yes" or "No" to donate organs must be honored in all cases, even after the potential donor has deceased and the next of kin disagrees	21 (52.5)	9 (39.1)	12 (70.6)	0.06
10) Aware that after performing the brain death exam, finding a patient to be brain dead, and pronouncing the time of death, the physician should wait to allow the family time to process the diagnosis of brain death before discussing organ donation (instead of discussing the topic immediately)	8 (20.0)	8 (34.8)	0 (0.0)	0.01

OPO=Organ Procurement Organization

Data cells show number of trainees (% of column-wise total sample) who answered the question correctly

^INumber of individuals who answered that question correctly

Table 3Associations between Trainee Characteristics and High Knowledge Score¹

Characteristic	RR ² (95% CI)	P-Value
Fellow (vs. Resident)	0.75 (0.48-1.19)	0.2
Surgery/anesthesia career plans (vs. medicine/other)	0.80 (0.48-1.34)	0.4
Critical care career plans (vs. medicine/other)	0.65 (0.37-1.12)	0.1
Previously facilitated organ donor conversion	1.15 (0.76-1.75)	0.5
Aware that any guidelines for caring for a potential organ donor exist	0.99 (0.65-1.49)	0.9
Familiar with the OPO's guidelines for caring for a potential organ donor	0.82 (0.47-1.43)	0.5
Received formal instruction from an OPO about brain death criteria or caring for a potential organ donor	1.08 (0.58-1.99)	0.8
Believes that the OPO has the primary responsibility for speaking with the family of a deceased potential organ donor about organ donation	0.90 (0.59-1.38)	0.6
Agrees that there is time to effectively practice OPO recommendations for organ donor referral and transition to the OPO during critical care training	0.82 (0.47-1.43)	0.5
Agrees that the 24 hour presence of the OPO in the intensive care unit is beneficial	0.56 (0.35-0.89)	0.01
Agrees that the LLF's recommendations on caring for potential organ donors are effective	0.64 (0.39-1.05)	0.08
Agrees that OPO practices are effective at maximizing organ procurement	0.72 (0.40-1.29)	0.3

RR=relative risk

CI=confidence interval

OPO=Organ Procurement Organization

LLF=Living Legacy Foundation

¹ A high knowledge score was empirically defined as answering 5 out of 10 questions correctly² Relative risk was calculated using modified Poisson