

The Implementation of a Multidisciplinary Approach for Potential Organ Donors in the Emergency Department

Marloes Witjes, MSc,^{1,2} Angela M.M. Kotsopoulos, MD,³ Luuk Otterspoor, MD,⁴ Ingeborg H.F. Herold, MD,⁴ Koen S. Simons, MD,⁵ Karen Woittiez, MD,⁶ Jos J.A. Eijkenboom, MD,⁷ Johannes G. van der Hoeven, MD, PhD,¹ Nichon E. Jansen, PhD,² and Wilson Farid Abdo, MD, PhD¹

Background. The aim of this study was to evaluate the implementation process of a multidisciplinary approach for potential organ donors in the emergency department (ED) in order to incorporate organ donation into their end-of-life care plans. **Methods.** A new multidisciplinary approach was implemented in 6 hospitals in The Netherlands between January 2016 and January 2018. The approach was introduced during staff meetings in the ED, intensive care unit (ICU), and neurology department. When patients with a devastating brain injury had a futile prognosis in the ED, without contraindications for organ donation, an ICU admission was considered. Every ICU admission to incorporate organ donation into end-of-life care was systematically evaluated with the involved physicians using a standardized questionnaire. **Results.** In total, 55 potential organ donors were admitted to the ICU to incorporate organ donation into end-of-life care. Twenty-seven families consented to donation and 20 successful organ donations were performed. Twenty-nine percent of the total pool of organ donors in these hospitals were admitted to the ICU for organ donation. **Conclusions.** Patients with a devastating brain injury and futile medical prognosis in the ED are an important proportion of the total number of donors. The implementation of a multidisciplinary approach is feasible and could lead to better identification of potential donors in the ED.

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INTRODUCTION

Organ donor shortage is a major healthcare issue worldwide. Between countries there is a wide variation in deceased donor rates. One of the main bottlenecks in the donation process is the identification of potential donors outside the intensive care unit (ICU).¹⁻⁴

Organ donation awareness is high in the ICUs. For instance, national data of The Netherlands show that

almost 100% of the potential donors are identified as such.⁵ However, we showed in a recent cohort study that awareness outside the ICU is lower and could result in unrecognized potential donors, especially in the emergency department (ED).¹ These unrecognized potential donors were mostly patients with a devastating brain injury (DBI) and a futile medical prognosis in the ED. These patients were subsequently admitted to the neurology department for end-of-life care or died in the ED, without any consideration of organ donation. Other international studies reporting on data from the United Kingdom, Spain, and United States

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Correspondence: Wilson Farid Abdo, MD, PhD, Department of Intensive Care Medicine, Radboud University Medical Center, P.O. Box 9101, Internal post 710, 6500 HB Nijmegen, The Netherlands. (f.abdo@radboudumc.nl).

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¹ Department of Intensive Care Medicine, Radboud University Medical Center, Nijmegen, The Netherlands.

² Dutch Transplant Foundation, Leiden, The Netherlands.

³ Department of Intensive Care, Elisabeth Tweesteden Hospital, Tilburg, The Netherlands.

⁴ Department of Intensive Care, Catharina Hospital, Eindhoven, The Netherlands.

⁵ Department of Intensive Care, Jeroen Bosch Hospital, 's-Hertogenbosch, The Netherlands.

⁶ Department of Intensive Care, VieCuri Hospital, Venlo, The Netherlands.

⁷ Department of Intensive Care, Maxima Medical Center, Veldhoven, The Netherlands.

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showed the importance of the role of emergency medicine in organ donation, while donor identification in the ED is still suboptimal.^{2,4,6-10} Literature suggests the implementation of a multidisciplinary approach as an effective intervention to improve identification in the ED.^{3,7,11-14}

We used the results of these studies to develop a multidisciplinary approach and implement this approach in 6 hospitals in The Netherlands. This approach defines the triggers for identification of potential organ donors and the roles of the different disciplines in organ donation. Where in Spain it is more common to continue care in patients that have a futile prognosis in the ED to enable organ donation, this is not the common practice in other countries when the decision to withdraw care is made outside the ICU.^{1,11,14} The aim of our multicenter prospective study was to evaluate the implementation process of a new approach for potential organ donors in the ED. The approach had 2 aims. The first aim was to increase awareness surrounding identification of potential organ donors in the ED. The second aim was to incorporate organ donation into end-of-life care of possible donors once identified.

MATERIALS AND METHODS

Study Design and Setting

In total, 6 hospitals in The Netherlands implemented the new approach (2 hospitals with neurosurgical facilities, including one University hospital and 4 general hospitals). These 6 hospitals also participated in an earlier study which showed that there could be unrecognized potential organ donors outside the ICU.¹ Three hospitals started using the approach from January 2016, 2 hospitals started from December 2016 and one from April 2017. All hospitals were followed until December 2017, except for

one hospital starting from April 2017 that was followed until January 2018. This stepwise implementation of the approach was performed to learn from the experiences in the first hospitals before implementing the approach in the other hospitals. The medical ethical committee waived the need for informed consent.

Multidisciplinary Approach

A new multidisciplinary approach was developed which defined the triggers for identification of potential organ donors and the roles of the different disciplines (Figure 1). The roles of the emergency physician, neurosurgeon, and neurologist were clearly defined and entailed the identification of potential organ donors within their patients with acute brain injury that had a futile prognosis. These physicians then had to consult the Donor Registry (DR) after identification of a potential organ donor in the ED. Once a patient met the criteria, and if the intensivists was not already part of the decision-making in the ED, the emergency physician, neurosurgeon, or neurologist would contact the intensivist for consultation about the possibility of organ donation and ICU admission. If family members were present, they would be informed about the futility of treatment by the neurologist, neurosurgeon, and emergency physician. Whether or not organ donation was concurrently discussed in the ED or would be deferred to a later moment (ie, if families were too emotional), was left to the clinical judgment of the physician. As per protocol, the possibility was open to transfer these patients to the ICU in order to give the family more time to grieve, discuss organ donation, and start end-of-life care. If such a path was chosen, withdrawal of life-sustaining treatment would not start in the ED. In The Netherlands, a physician approaches the family for organ donation. In almost all

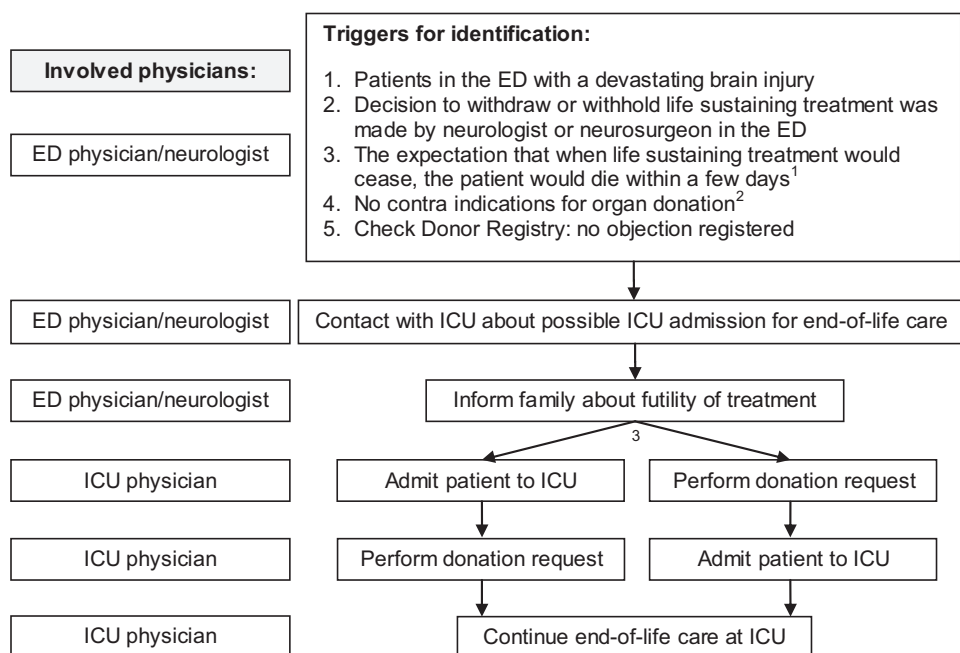


FIGURE 1. Multidisciplinary approach in which the triggers for identification for potential organ donors are specified and the roles of the different disciplines are defined. ¹This criterion was introduced in order not to admit patients that had a high probability of not dying within a timeframe that excluded donation after circulatory death. ²If there was any doubt about medical suitability, a transplant coordinator or intensivist could be contacted. ³The treating team had the option to discuss/request organ donation in the ED or to defer it until after ICU admission. If donation was requested in the ED, patients were admitted to the ICU when consent was obtained, or when more time was needed to make a decision on donation. ED, emergency department; ICU, intensive care unit.

cases, this is an ICU physician who also has followed communication training for donation. The transplant coordinator becomes involved once the family has consented to organ donation.

In some hospitals, organ donation was primarily discussed in the ICU to decouple the organ donation request from the discussion about futility of treatment in the ED. In this way, the family had more time to process the news of the upcoming death of their loved one before organ donation was discussed. In other hospitals, organ donation requests were primarily made in the ED in order not to admit patients to the ICU that would not donate. A potential donor would then be admitted to the ICU to incorporate organ donation into end-of-life care when he/she was registered with consent in the DR, or when the family consented to organ donation, or when the family needed more time to make a decision. One general hospital implemented the approach also for patients who were already admitted to the neurology department and who deteriorated subsequently during their admission leading to a futile prognosis.

Before Implementation

In The Netherlands, all medical files of each mortality case in the ICU are systematically reviewed to analyze whether or not the patient was a potential donor. With regard to potential donors outside the ICU, there is no coherent strategy to analyze mortality cases as occurs in the ICU. Also, there is no coordinated strategy to recognize potential donors outside the ICU, for example, consult the ICU and refer patients to the ICU to facilitate organ donation. In a previous study, we showed in the same hospitals that have participated in this study that before implementation, some patients in the ED were recognized as potential donors and referred to the ICU, but this occurred randomly and depended on the donation knowledge of the treating physician.¹ The current approach offered these hospitals a stepwise methodology with defined roles and responsibilities including a multidisciplinary effort in order not to miss any potential donors. In addition to the multidisciplinary approach, nonintubated patients were considered for ICU admission to facilitate organ donation. Previous to implementing this approach, nonintubated patients were not regarded as potential organ donors.

Implementation Strategy

The new approach was implemented using the Plan-Do-Study-Act (PDSA) method.¹⁵ This method helps breaking down the task (implementing the approach) into steps, evaluate the outcome, improving it, and testing again. Multiple PDSA cycles were repeated to implement the change.

The new approach was introduced in the 6 hospitals after several separate meetings with ED, ICU, and neurology staff in each hospital. These meetings were presided by an intensivist specialized in organ donation and accompanied by the principal investigator. Discussions included explaining the nontherapeutic ICU admission to the family, the location where donation should be requested (ED/ICU), and the use of ICU resources. Several participants stated that ICU admission should only be reserved for salvageable patients and not to initiate end-of-life care. Therefore, several additional meetings were arranged to discuss this

subject further and hospitals made their own adjustments to the protocol, the latter being mostly minor and meant to clarify the protocol. Also after the hospitals started using the new approach, meetings were arranged by the principal investigator to present the results and discuss the progress.

Outcome Measures and Data Analysis

During the intervention period, the in-house donation coordinators screened the records of all deceased patients from the ED to check if patients met the inclusion criteria. The inclusion criteria were: patient in the ED with a DBI and a futile prognosis, the expectation that the patient would die within a few days, no contraindications for organ donation, and no objection registered in the DR. When a patient met the inclusion criteria and was admitted to the ICU to incorporate organ donation into end-of-life care, the principal investigator was informed. The principal investigator then approached the involved physicians for an evaluation according to a standardized questionnaire (Questionnaire S1, SDC, <http://links.lww.com/TP/B720>). The questionnaire was based on our previous study¹ and developed by a team of (donation) intensivists and (senior) researchers. Two of the researchers were specialized in implementation research. Also when a potential organ donor was not admitted to the ICU, an evaluation was performed. Interviews were conducted with emergency physicians, neurologists, neurosurgeons, ICU physicians, and nurses. The standardized questionnaire consisted of 27 items describing the conditions in which the ICU admission took place. Items discussed were, for example, characteristics of the patient, presence of family in the ED, place where futility of treatment was discussed with the family, which physician consulted the DR and requested for donation, and decision of the family. At the end, there were open questions including bottlenecks and ethical issues surrounding the ICU admission. If necessary, adjustments were made to the approach and meetings were organized to discuss experiences and bottlenecks. These meetings were organized by the principal investigator and intensivist together with physicians of the different disciplines.

SPSS (IBM), version 22, was used to analyze the descriptive data of the standardized questionnaire and the data gathered by the in-house donation coordinator.

RESULTS

Characteristics of Study Subjects

Out of 5103 hospital deaths, 67 patients had a futile prognosis in the ED and organ donation was considered. Twelve of these patients were not admitted to the ICU (Figure 2). In total, 55 patients were admitted to the ICU to incorporate organ donation into end-of-life care. Demographic characteristics of these 55 patients are shown in Table 1. Evaluations were conducted with emergency physicians (n = 11), neurologists/neurosurgeons (n = 30), ICU physicians (n = 36), and emergency/ICU nurses (n = 12). Thirty-eight evaluations were performed in a face-to-face setting, 51 via telephone.

Main Results

Table 2 shows the end-of-life conditions of potential organ donors that were admitted to the ICU. At the time

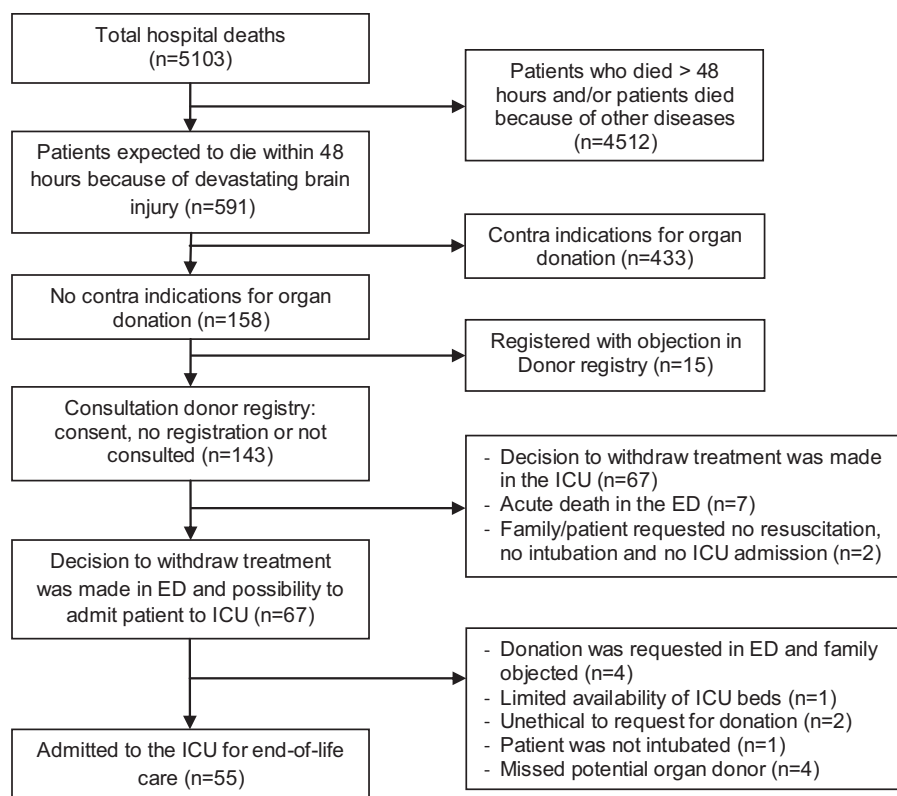


FIGURE 2. Flow diagram showing the inclusion of deceased patients admitted to the ICU for end-of-life care. ED, emergency department; ICU, intensive care unit.

of decision to withdraw treatment, 43 patients (78.2%) were already mechanically ventilated and 12 (21.8%) were not (Table 2). Of these 12 patients, 5 patients were not intubated because the families objected to organ donation. The other 7 patients were subsequently intubated solely for the purpose of organ donation. Two of these 7 patients were intubated in anticipation of arrival

of family members and turned out to be medically unsuitable for donation. Four were intubated after the family consented to intubation to make organ donation possible. Three of these 4 patients donated their organs and one patient was found to be medically unsuitable after additional testing. One of the 7 patients was registered with consent in the DR, and was intubated in anticipation of arrival of family members, after which the family agreed to donation.

TABLE 1.

Demographic characteristics of the patients admitted to the ICU to incorporate organ donation into end-of-life care (n = 55)

	Median (Q1–Q3)
Age	59.0 (47.0–70.0)
Glasgow Coma Score	3.0 (3.0–4.0)
Time between diagnosis of futility of treatment and death (h)	15.0 (9.0–21.0)
Time between ICU admission and death (h)	14.0 (9.8–21.0)
	No. (%)
Gender	
Male	26 (47.3)
Female	29 (52.7)
Diagnosis	
(Intra)cerebral/brainstem hemorrhage	19 (34.5)
Traumatic brain injury	18 (32.7)
Subarachnoid hemorrhage	11 (20.0)
Subdural hemorrhage	4 (7.3)
Out of hospital cardiac arrest	2 (3.6)
Cerebral infarction	1 (1.8)

ICU, intensive care unit.

In total, 42 donation requests (76.4%) were performed in the ICU (Table 2). In 5 cases, the possibility of organ donation was already discussed in the ED without making a formal donation request. In total, 6 donation requests (10.9%) were performed in the ED. Three patients that were admitted to the ICU solely for organ donation purposes came from the neurology department where their clinical condition had deteriorated to a state which led to a futile prognosis (Table 2).

Transplantation

In total, 27 families consented to organ donation (Table 2). In these 27 patients, 23 initiated organ donation procedures were performed leading to 20 successful donors (17 donation after brain death and 3 donation after circulatory death [DCD]). Ninety organs were transplanted (8 hearts, 12 pancreas, 39 kidneys, 17 livers, and 14 lungs). Also, 12 deceased patients became tissue donors. Seven consents did not lead to successful donations because these potential organ donors were considered to be medically unsuitable in the end (n = 5) or did not become brain dead and could not donate according to the age criteria for DCD (n = 2).

TABLE 2.**End-of-life care conditions of potential organ donors admitted to ICU (n = 55)**

	No. (%)
Unit/ward where diagnosis of futility of treatment was made	
ED	51 (92.7)
Neurology	3 (5.5)
Other ^a	1 (1.8)
Was the patient intubated at time of diagnosis of futility of treatment?	
Yes	43 (78.2)
No	12 (21.8)
In patients that were not intubated at time of diagnosis of futility of treatment, was patient intubated solely for the purpose of organ donation? (n = 12)	
Yes	7 (58.3)
No	5 (41.7)
Outcome of consulting the donor registry	
Consent	19 (34.5)
Objection	1 (1.8)
Decision should be made by family/specific person	2 (3.6)
Not registered	30 (54.5)
Not consulted ^b	3 (5.5)
Who consulted the donor registry? (n = 52)	
Intensive care physician	30 (57.7)
Neurology physician	9 (17.3)
Emergency physician	11 (21.2)
Other ^c	2 (3.8)
Did the family mention donation in the ED?	
Yes	5 (9.1)
No	40 (72.7)
No, because family was not present at ED	10 (18.2)
Did the physician/nurse mention donation in the ED?	
Yes	9 (16.4)
No	36 (65.5)
No, because family was not present at ED	10 (18.2)
Unit/ward where poor prognosis was explained to the family (for the first time)	
ED	35 (63.6)
Neurology	3 (5.5)
Intensive care	17 (30.9)
Unit/ward where organ donation was requested	
Intensive care	42 (76.4)
ED	6 (10.9)
Neurology	2 (3.6)
Donation was not requested ^d	5 (9.1)
Decision of the family on donation (n = 50)	
Consent	27 (54.0)
Objection	23 (46.0)

^aOther: operation room (n = 1).^bReasons for not consulting donor registry: not a Dutch citizen (n = 2) and paper donor card at home (n = 1).^cOther: physician assistant (n = 2) and specialist nurse (n = 1).^dReasons for not performing the donation request: acute death (n = 1), patient was registered with objection (n = 1), patient would not become brain death and was older than 75 y, ie, unsuitable for donation after circulatory death (n = 1), medical contra indication (n = 1), and family was very emotional (n = 1).

ED, emergency department.

Potential Organ Donors Not Admitted to ICU

Some potential organ donors were not admitted to the ICU (Figure 2). Reasons for this were: objection to donation in the ED by next of kin (n = 4), limited availability of

ICU beds (n = 1), and refraining from asking the donation question by the physician due to ethical reasons (n = 2). Four potential organ donors were not identified as such and were admitted to the neurology department. These 5 cases were evaluated according to the PDSA method and were discussed during staff meetings to further improve implementation of the approach.

Contribution of ED Donors on Total Donor Pool

Out of 5103 hospital deaths in the study period, there were in total 254 potential organ donors (5.0%). From these 254 potential organ donors, 55 patients were admitted to the ICU solely for the purpose of organ donation (Table 2). Of these 55 patients, 20 donated their organs. During the study period, a total of 69 patients donated their organs in the 6 hospitals. This means that in 29% of the total pool of organ donors in the participating hospitals, futility of prognosis was already made before admission to the ICU. In our study, the 3 donation after brain death donors with a futile prognosis at admission, donated on average 4.5 organs per donor compared with approximately 3.8 organs per donor nationwide in 2016. DCD donors donated on average 2.7 organs per donor in our study compared with 2.8 nationwide.

Ethical Problems and Improvements of the Approach

We have used multiple PDSA cycles to implement the approach. In the upcoming paragraphs, we would like to describe the outcomes of these cycles and the improvements we made to the approach.

First, before start of the implementation, several physicians in all participating hospitals foresaw problems explaining a nontherapeutic ICU admission to the family. Our approach was initially presented in such a way that the organ donation request was preferably decoupled from the conversation about futility of treatment to give the family more time to grieve. In most situations, this meant that donation was requested in the ICU. However, many of the treating physicians had ethical issues with such a setup, because it would mean they had to discuss that the patient would be admitted to the ICU to give the family more time to grieve without discussing organ donation in the ED. Before starting in the first hospital, we jointly adjusted the approach and included 2 possible options: (1) organ donation discussion would be done in the ED or (2) organ donation discussion would be deferred until after ICU admission (Figure 1). It was up to the treating team to choose which option would suit the specific patient case. We also included examples of how to inform the family in situations where Intensive Care to facilitate Organ Donation (ICOD) was a possibility. Although before starting the implementation, most physicians thought they would discuss organ donation in the ED, their natural response when guiding these families in the ED was to defer organ donation discussion until after ICU admission. In 84% of all organ donation requests, organ donation was discussed in the ICU (Table 2). This was an important point for additional hospitals that started later with the implementation, but also for us as a team. Once we communicated that both options are possible in all circumstances, it was no longer seen as a problem. During the

implementation, this point was evaluated specifically, and was not mentioned as an issue in any of the patient cases.

Second, several patient cases showed dilemmas regarding intubation of a patient with the sole purpose of organ donation. In a few of these cases, family was not present while the patient deteriorated rapidly. The dilemma was whether to intubate the patient before any consent from the family. We used these cases to educate physicians about the (legal) possibilities to intubate a patient for organ donation and discuss ethical issues.

Third, beforehand, several ICU physicians thought admission of such patients could be a problem due to bed capacity and availability of staff. Of the 67 patients where the decision to withdraw treatment was made in the ED, only one was not admitted due to bed capacity (Figure 2).

DISCUSSION

The typical organ donor is a patient that is treated in the ICU until clinical deterioration and subsequently becomes an organ donor. In this study, we showed that 20 patients donated their organs out of a cohort of 69 patients with a DBI with futile prognosis in the ED. This highlights the importance of a close collaboration between the ED and medical teams involved in organ donation. We showed that collaboration between such teams and the ED is feasible and important in donor identification, as we have shown that only a few potential organ donors were not recognized during the implementation period compared with an earlier cohort in the same hospitals.¹

Other international studies have also shown that potential organ donors are missed in the ED.^{4,11,16-18} The College of Emergency Medicine and the British Transplantation Society reported that the ED has a poorly recognized, but important role in the identification and referral of patients who may be potential organ donors.² One of their recommendations was to develop policies and guidelines that describe the care of a potential organ donor and plan the transfer of care of the potential donor from the ED to the ICU.

Several intervention studies aimed to improve identification and the care for potential organ donors in the ED.^{6,7,19,20} These studies implemented some kind of multidisciplinary approach for organ donation in the ED describing the triggers for identification of potential organ donors and the steps to be taken to make organ donation possible. In 2 studies, the implementation of such an approach resulted in an increased referral of potential organ donors to organ donation services, although many of these referrals did not lead to organ donation procedures.^{6,20} Other studies showed that most of the referrals from the ED led to successful donation procedures.^{7,11,14,19} Most of these studies were from Spain, where ICOD is more routine practice.^{3,7,11,14} A recent study of Martínez-Soba et al¹⁴ described their experience with an ICOD protocol comparable to the one we used in our study. While they performed a retrospective study focusing on patients in the ICU, emergency or hospital ward, we performed a prospective study focusing on patients where the futile medical prognosis was made by a multidisciplinary team in the ED.

In our study, 55 patients were admitted to the ICU to incorporate organ donation into end-of-life care. In 27 of

these cases, their families consented to organ donation. One could argue that in the 28 cases where families objected, ICU resources were unnecessarily used. However, organ donation was often not the only reason to admit patients to the ICU. Most patients were intubated. In some cases, family members were not present at all in the ED. In others, family members needed more time to accept the loss of their loved one and make a decision on donation. These circumstances necessitate admission to the ICU, as most EDs are not equipped to have critically ill or intubated patients for prolonged periods of time. On the other hand, ICU resources are limited. In order to have efficient use of both ED and ICU resources, a multidisciplinary approach is needed in our opinion. This minimizes admission of a high number of potential organ donors to the ICU which are likely not to donate as was shown earlier by others.^{6,20}

Our approach has multiple beneficial effects, which could justify the use of ICU resources for potential organ donors. First, it has been shown in the literature that donation could have a beneficial effect on the bereavement process for donor families.^{21,22} Second, our approach could increase the number of organ donors. Although for many organs there is discussion whether organ transplantation reduces healthcare costs, it has been reported that it could reduce the costs in the case of kidney transplantation. For instance, transplantation of a kidney involves one-off costs, while the costs for dialysis are lifelong. For the Dutch situation, dialysis costs approximately 55 000 euros per patient per year. A kidney transplant costs 80 000 euros in the first year. Every year thereafter costs 8000 euros per patient for nephrological aftercare with medicines. After 15 years, the saving is 633 000 euros.²³

The NeuroCritical Care Society recommended in 2015 to delay decisions regarding end-of-life care within the 72 hours in patients with DBI, regardless of organ donation potential, in order not to miss the small potential for good medical outcome.²⁴ Others have also written in favor of delaying prognostication in cases of DBI.²⁵ Delaying prognostication necessitates physical stabilization and admission to the intensive care. However, data from different countries, for example, the United Kingdom, The Netherlands, and the United States, show that organ donors are missed within those patients that die on the ED.^{1,9,10} For example, the NHS Blood and Transplant in the United Kingdom reports that from 2012 to 2016, there were over 1500 patients who died in the ED who met the criteria for referral as a potential donor. In three-quarters of these cases, donation was a possibility. However, only 46% of the potential organ donors were referred to the organ donation team and just 3% actually donated organs after death.⁹ After implementing our protocol, we showed that only 6% (4 of 67) potential organ donors were missed in the ED.

Organ donation awareness in the ED is important, because 29% of the total pool of organ donors in the participating centers presented in the ED with a fatal brain injury. This is comparable to what others reported.^{3,7} In addition, in a retrospective cohort study, it was shown that ED referrals for organ donation lead to more organs per donor than intensive care referrals.²⁶

A limitation of our study is that, although a substantial proportion of our donors came from the ED, we cannot exactly define which patients would have been missed if

our implementation strategy would not have been used. However, in an earlier report, we showed that there could be a substantial number of missed potential organ donors outside the ICU.¹ The hospitals that participated in the data we present here were also part of that earlier study. A comparison with other hospitals that did not participate is not easy to make as the number of donors depends on several factors (eg, number of medically suitable potential donors, hospital type and protocol being used, and consent by family) and fluctuates over the years.⁵ Also, the primary aim of our study was to evaluate the implementation process, and not the effect it had on the number of potential donor identifications and referrals. Such an approach would necessitate 2 patient groups including randomization. Apart from not being our primary aim, it would also be ethically difficult to justify randomization and withholding an ICU admission in patients with a DBI, even if their prognosis was deemed futile. Although our previous cohort study and the data of this implementation period are not fully comparable, we have shown that in the implementation period only 4 out of 67 potential organ donors were missed (6%). This was significantly lower than our previous cohort, in which the number of unrecognized potential donors in the ED was 37 out of 98 potential donors outside the ICU (38%).

In conclusion, organ donors from the ED with a fatal brain injury are an important portion (29%) of the total pool of organ donors. The implementation of a multidisciplinary approach is feasible and could improve donation awareness in the ED and lead to better identification of potential donors in the ED.

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REFERENCES

1. Witjes M, Kotsopoulos A, Herold IHF, et al. The influence of end-of-life care on organ donor potential. *Am J Transplant.* 2017;17:1922–1927.
2. Steering Group of College of Emergency Medicine and the British Transplantation Society. *The role of emergency medicine in organ donation.* 2010. Available at <https://bts.org.uk/wp-content/uploads/2016/09/Role-of-emergency-Medicine-in-Organ-Donation.pdf>. Accessed June 25, 2018.
3. Domínguez-Gil B, Coll E, Pont T, et al; en representación del Consorcio ACCORD-España. End-of-life practices in patients with devastating brain injury in Spain: implications for organ donation. *Med Intensiva.* 2017;41:162–173.
4. Greene J. Organ donation in the emergency department; a missed opportunity? *Ann Emerg Med.* 2012;59:A19–A21.
5. Dutch Transplant Foundation. *Annual report 2017 of the Dutch transplant foundation.* Available at https://www.transplantatiestichting.nl/sites/default/files/product/downloads/nts_jaarverslag_2017.pdf. Accessed June 25, 2018.
6. Bleakley G. Implementing minimum notification criteria for organ donation in an acute hospital's critical care units. *Nurs Crit Care.* 2010;15:185–191.
7. Caballero F, Puig M, Leal J, et al. A helpful approach to organ donation: from end-of-life care to effective organ transplantation. *Am J Transplant.* 2018;18:528–529.
8. Michael GE, O'Connor RE. The importance of emergency medicine in organ donation: successful donation is more likely when potential donors are referred from the emergency department. *Acad Emerg Med.* 2009;16:850–858.
9. Organ Donation and the Emergency Department Strategy Group of the NHS Blood and Transplant. *Organ donation and the emergency department—a strategy for implementation of best practice.* 2016. Available at <https://nhsbt.dbe.blob.core.windows.net/umbraco-assets-corp/2098/ed-strategy-final-nov-2016.pdf>. Accessed October 12, 2018.
10. Traino HM, Alolod GP, Shafer T, et al. Interim results of a national test of the rapid assessment of hospital procurement barriers in donation (rapid). *Am J Transplant.* 2012;12:3094–3103.
11. Domínguez-Gil B, Coll E, Elizalde J, et al; ACCORD-Spain study group. Expanding the donor pool through intensive care to facilitate organ donation: results of a Spanish multicenter study. *Transplantation.* 2017;101:e265–e272.
12. Empson K, Beale S, Kerr J, et al. 25 Organ donation in emergency departments: an analysis of best practice. *Emerg Med J.* 2017;34:A877–A878.
13. Gardiner DC, Nee MS, Wooten AE, et al. Critical care in the emergency department: organ donation. *Emerg Med J.* 2017;34:256–263.
14. Martínez-Soba F, Pérez-Villares JM, Martínez-Camarero L, et al. Intensive care to facilitate organ donation: a report on the experience of 2 Spanish centers with a common protocol. *Transplantation.* 2019;103:558–564.
15. Langley GJ, Moen RD, Nolan KM, et al. *The Improvement Guide: A Practical Approach to Enhancing Organizational Performance.* 2nd ed. San Francisco, CA: Jossey-Bass; 2009.
16. Aubrey P, Arber S, Tyler M. The organ donor crisis: the missed organ donor potential from the accident and emergency departments. *Transplant Proc.* 2008;40:1008–1011.
17. Le Conte P, Riochet D, Labastire L, et al. Identification of potential organ donors of advanced age in EDs. *Am J of Emerg Med.* 2012;30:170–173.
18. Sairanen T, Koivisto A, Koivusalo AM, et al. Lost potential of kidney and liver donors amongst deceased intracerebral hemorrhage patients. *Eur J Neurol.* 2014;21:153–159.
19. Feest TG, Riad HN, Collins CH, et al. Protocol for increasing organ donation after cerebrovascular deaths in a district general hospital. *Lancet.* 1990;335:1133–1135.
20. Garside J, Garside M, Fletcher S, et al. Utilisation of an embedded specialist nurse and collaborative care pathway increases potential organ donor referrals in the emergency department. *Emerg Med J.* 2012;29:228–232.
21. Merchant SJ, Yoshida EM, Lee TK, et al. Exploring the psychological effects of deceased organ donation on the families of the organ donors. *Clin Transplant.* 2008;22:341–347.
22. Kentish-Barnes N, Cohen-Solal Z, Souppart V, et al. Being convinced and taking responsibility: a qualitative study of family members' experience of organ donation decision and bereavement after brain death. *Crit Care Med.* 2019;47:526–534.
23. Dutch Transplant Foundation. *What to do? Dialysis or transplantation?* 2014. Available at <https://www.transplantatiestichting.nl/nieuws/wat-te-doen-dialyse-transplantatie>. Accessed January 18, 2019.
24. Souter MJ, Blissitt PA, Blosser S, et al. Recommendations for the critical care management of devastating brain injury: prognostication, psychosocial, and ethical management: a position statement for healthcare professionals from the neurocritical care society. *Neurocrit Care.* 2015;23:4–13.
25. Manara AR, Thomas I, Harding R. A case for stopping the early withdrawal of life sustaining therapies in patients with devastating brain injuries. *J Intensive Care Soc.* 2016;17:295–301.
26. Miller LD, Gardiner SK, Gubler KD. Emergency department referral for organ donation: more organ donors and more organs per donor. *Am J Surg.* 2014;207:728–33; discussion 733.