

THERE IS AN ANSWER TO THE SHORTAGE OF ORGAN DONORS

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From a retrospective review of 32,562 deaths that occurred in 1988 in the service area of Kentucky Organ Donor Affiliates, an area with a population of 3.4 million, 173 potential solid organ donors were identified for a rate of 50.8 donors per million population base. There were only 38 actual solid organ donors from this potential pool. The physician failed to recognize the potential for donation in 29 instances and in 92, the family refused consent for donation.

In the second phase of the study, we analyzed 155 consecutive medically suitable organ donor referrals for one year. A specific focus on the process and timing of the request for donation was made in this review. In 143 of these instances (92 per cent), a clear temporal separation of the explanation of death or the certainty of family acceptance of death before the request for donation yielded a donor success in 53 of 82 instances. In contrast, only 11 of 61 instances resulted in a consent when the discussion of death and donation were combined into one discussion with the family ($p < 0.05$).

From this study, there seemed to be adequate numbers of organs available to provide for the current pool of recipients within the state of Kentucky. Educational assistance and an ongoing individual patient review of each death improved the donor rate during the time frame of this study. It is essential to allow a temporal separation between the explanation of death and the request for organ donation to maximize actual organ donation.

THE LENGTHY LIST of patients from across the United States who are awaiting an organ transplant foretell that vascularized organs for transplantation are in short supply (1). In contrast with this shortage of organs, the results of several studies suggest that the population of potential organ

donors far exceeds the demand for transplantable organs (2, 3). However, less than one-fourth of potential organ donors actually yield a usable organ for transplantation; thus, the rate of organ retrieval has not kept pace with the ever increasing demand.

Several factors have been implicated in this "organ shortage," not the least of which is non-supportive attitudes by donor referral physicians or the refusal on the part of the grieving families to donate. Yet, the results of studies of physician and public attitudes toward donation have largely indicated a strong support for the concept of transplantation, organ donation and a willingness to participate in the process (4, 5). In an effort to improve the rate of donor recovery within our service area, the organ procurement agency for the state of Kentucky, Kentucky Organ Donor Affiliates, chose to focus educational and procurement resources on selected physicians and hospital personnel. By studying all deaths occurring within the state of Kentucky during one year, we attempted to define accurately both the potential and location of the donor pool within our state. We focused on the dynamics of the request process in an effort to outline those factors that provided an opportunity for a successful retrieval of organs.

MATERIALS AND METHODS

To establish the number and location of potential donors in the initial survey, all deaths that occurred in Kentucky during the year 1988 were studied. Data were obtained from death records for the Kentucky Department of Vital Statistics and from the Provisional Report of Death, a document completed at the time of death at all county health departments throughout Kentucky. The Kentucky Organ Donor Affiliates internal referral report provided a final check on the completeness of the data base.

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Reprint from SURGERY, Gynecology & Obstetrics, November, 1991, Vol. 173, 391-396

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Deaths that occurred in three northern Kentucky counties that were outside the area of organ procurement service and those patients who died outside of a hospital were removed from the data base. The limitation of age for procurement of a vascularized organ was defined as 65 years. Infants who weighed less than 2.7 kilograms were also deleted from the review. Patients who died during the initial six hours of hospitalization were included in the study.

Using the ICD-9-CM (International Classification of Diseases, 9th edition of Clinical Modification. The national standard for diagnoses) diagnosis code, the remaining potential population of donors was screened for standard contraindications to organ donation. These contraindications included malignancy not confined to the central nervous system or the presence of a systemic infectious process of viral or bacterial etiologic nature. The remaining records in which the ICD-9-CM code was even remotely consistent with a possible diagnosis of brain death were selected for an on-site chart analysis. All deaths that were coded as secondary to trauma or those classified as deaths occurring during an emergency situation were included.

The on-site review of charts was conducted by procurement coordinators and cross-checked by transplant physicians. Data obtained from this review included age, gender, race, educational level achieved, the hospital of origin, length of hospitalization and the absence of contraindications to organ donation. Using standard data as listed in the medical record, an assessment of the usability of individual organs was made. Organs were considered "unsuitable" if they had direct injury, grossly abnormal laboratory values or a strong past history of systemic disease, such as diabetes mellitus or uncontrolled hypertension. Borderline usability of organs was assured by a transplant surgeon.

The charts of all patients with any potential for organ recovery were reviewed for the timing and declaration of death, whether or not brain death had occurred and whether or not any subsequent notification of the family and request for organ donation had been made. Each chart was reviewed for the presence of criteria for brain death. These criteria included notes by physicians of brain death, laboratory studies (electroencephalogram recordings and cerebral blood flow studies) and findings at physical examination or clinical variables compatible with brain death that were listed in progress or nursing notes. Each

patient was then classified as to whether or not brain death had or had not occurred. The presence of brain death was confirmed by a neurosurgeon. The individuals responsible for communication with the family about organ donation were recorded and the response of the family to this request was noted. Failures to obtain a donation were categorized as a medical care system failure, objection of the family or objection by the decedent to donation.

In the second phase of this study, from August 1989 through July 1990, all medically suitable donors who were referred to the organ procurement agency or were discovered from an ongoing death audit were reviewed. All data listed for the first phase study were collected on this group, but particular focus was placed on the process of approaching the family and outcome of consent. The timing of the determination of brain death, from initial injury through intubation and brain death declaration, was noted for organ procurement. These aspects of medical care were then correlated with the timing of the family preparation, education and approach as they relate to brain death and donation. Specifically, each aspect of the request was noted as to time of occurrence and the person who performed the task. The failure to obtain permission for donation was categorized again as to the reason for failure.

Each scenario was then analyzed and classified into one of two groups based on timing of the request for organ donation in relation with the explanation of brain death. A patient situation was considered decoupled when there was a clear indication that the family understood and accepted brain death before discussion of organ donation or there was a temporal separation between the explanation of brain death and the request for donation. Those instances in which these criteria did not exist and the death notice and donation request occurred simultaneously were classified as coupled.

RESULTS

According to the Kentucky Department of Vital Statistics, 35,009 deaths occurred in Kentucky during the calendar year of 1988. The 2,452 that occurred in the service area for the Cincinnati Organ Procurement Organization were not considered in this study. Of the remaining deaths, 23,263 occurred in patients more than 65 years of age and 3,420 occurred outside a hospital facility. Of the remaining 5,874 hospital deaths,

TABLE I.—DEMOGRAPHIC CHARACTERISTICS AND CAUSES OF DEATH

	Potential organ donors, n=173	Not donors, n=135	Actual donors, n=38
Gender			
Male	92	67	25
Female	81	68	13
Race			
White	155	119	36
Nonwhite	18	16	2
Age, yrs.	newborn* to 64	newborn* to 64	2 to 57
Education			
≤12 yrs.	55	43	12
>12 yrs.	67	51	16
Unknown	51	41	10
Cause of death			
Brain malignancy	10	8	2
Anoxic brain injury	15	10	5
Intracranial hemorrhage	48	44	4
Cerebrovascular incident	12	9	3
Congenital abnormality	4	3	1
Trauma	84	61	23

*One day old.

2,675 were excluded based on the presence of established contraindications for organ donation. This left 3,199 as a potential donor pool. Of these, 730 patients could not be excluded as organ donors based on the available ICD-9-CM data. As an internal check on this exclusion process, it was noted that none of the 222 actual organ or tissue donors procured during this same time in Kentucky were excluded by the initial computer review process.

The on-site chart review of the remaining 730 patients at 88 different hospitals eliminated another 557 patients from the potential organ pool. Thus, for Kentucky, there was the potential for 173 vascularized solid organ donors in 1988. This potential pool of donors represented almost 3 per cent of all hospital deaths occurring in patients less than the age of 65 years. One hundred and thirty of these potential donors were distributed in only ten hospitals. Only 38 yielded a usable organ.

In Table I, the demographic characteristics and causes of death of the potential donor and actual donor groups are listed. Most donors were male (66 per cent) and white (95 per cent); yet, all age, race, gender and education levels were equally represented in the potential and actual donor groups. Trauma was the leading cause of death in almost one-half of the potential donors and accounted for 60 per cent of the actual donors.

Nine patients died during the first few hours after arriving at the hospital and were listed as potential donors because of isolated extensive head injury. If these patients had received an aggressive resuscitative effort, all could have been salvaged for organ donation. In those instances

in which organ donation was not accomplished, objection of the family was listed as the reason for not donating on 92 occasions and five potential donors were known to have voiced an objection about donation to a family member before deaths occurred. However, in 29 instances, the medical care system failed to make a timely approach to the family. Most failures were attributed to a physician not identifying brain death, not allowing the family to be approached, not referring a family to the organ procurement agency or delaying referral until donor stability had deteriorated beyond acceptable limits. However, the physician was the person most likely to initiate the discussion regarding donation. In 100 instances, the physician was the responsible person who sought permission for organ donation. This was successful in 27 instances (27 per cent). In 35 instances, the nursing service made the request, resulting in a successful donation on six occasions. In 50 instances, the time of cardiac arrest was used to document the time of death, although donation had been considered in 12.

During the second phase of this study, 155 medically suitable donors were reviewed during a continuous period of 12 months. There were 64 actual donors during this time for a 41 per cent success rate. Age, educational level and cause of death in this group were similar to the initial potential donor pool. However, there were only two nonwhite patients in this second study group. One of these patients became a donor, but because of the small number, race could not be evaluated as to its effect on the donor process.

In 97 potential donors, the physician continued to be the person who initiated the request for

organ donation, being successful 35 times. Nursing personnel initiated requests on 31 occasions and were successful 11 times, while chaplin service was successful in five of nine instances. Ten donors were a direct result of a family-initiated contact with the organ procurement agency. Over-all, 64 donors were obtained from this second study group for a 41 per cent donor procurement rate.

When the potential donor was referred to the organ procurement agency before the family was approached, 35 actual donors resulted from 89 instances. When the family was approached before notification of the organ procurement agency, 29 of 66 instances resulted in donation. When the procurement coordinator was on site of the potential donation, 32 donors resulted from 73 instances, while 32 donors resulted from 82 requests when the coordinator was not present.

The findings of an analysis of the timing of the request indicated that, when the request for organ donation was coupled with the explanation of brain death in 62 instances, 11 donations occurred. If the donation request was separated from the brain death explanation, organ donation resulted in 53 of 93 instances. On 12 occasions, there was a known objection of the decedent to donation, which prevented the family from allowing an organ donation. Thus, in 143 instances in which no previous objection by the potential donor was known to exist, when the death was clearly explained and accepted by the family prior to the request for organ donation, a successful procurement occurred in 53 of 82 requests. In the remaining 61 instances, only 11 donations occurred ($p < 0.05$, chi-square), when the brain death explanation was coupled with the donation request.

DISCUSSION

This study was initially done to assess the potential for organ donation in Kentucky, which is a diffuse, primarily agricultural state with a population of 3.4 million. In this review of every death that occurred during 1988, 173 potential solid organ donors were found for a rate of 50.8 donors per million population base. This rate could have been higher had deaths outside of our arbitrarily set age limits been included. However, this rate is comparable with previous estimates of donors nationwide and would have been more than adequate to provide for the potential recipient pool within the same geographic boundaries. A study undertaken by the

Center for Disease Control in 1975 estimated a donor rate ranging from a minimum of 110 kidneys per one million to a maximum of 232 kidneys per one million, depending on criteria for donors (2). The results of the present study confirmed previous estimates by reviewing all deaths in Kentucky using on-site chart review of each potential death.

From this review, it was determined that 130 of 173 deaths occurred in just ten hospitals. This fact allowed the organ procurement agency to concentrate educational efforts on this select group of hospitals in an effort to improve the recovery rate in hospitals in which the most potential existed. A major unexpected benefit from this on-site chart review was the development of contacts in the record rooms of referral hospitals and, thus, a system for continued chart analysis of all deaths was established. This has allowed the agency the opportunity to measure the success of educational efforts in an ongoing and meaningful manner. Similarly, it has allowed each death to be individually reviewed by the physicians and hospital personnel and, thus, a dialogue and understanding of the techniques used during the request process has been established for each scenario of brain death used. Currently, all suitable deaths within these ten hospitals and most of those in other hospitals are being referred to Kentucky Organ Donor Affiliates for evaluation and assistance. For instance, in the second phase of this study, 155 deaths were noted, which would have been almost 90 per cent of our identified potential from the previous review of one year.

Age, gender, race and education level of the decedent have been proved to affect the rate of organ donation (6, 7). However, in our study, these factors had little influence on the final outcome, although the number of nonwhite donors was small. Two of 18 nonwhite patients were donors, which is similar to an 8 per cent nonwhite death rate in 1988. Sixty-six per cent of donors in our study were male, suggesting that families are more supportive of donation when the decedent is male.

Contrary to other published data (2), we suggest that most potential donors are being identified and the family is given the option to donate. In all but 29 of 173 instances, brain death was considered at some point during the hospitalization of the patient and the family was approached. However, these 29 instances and the additional nine instances when resuscitative efforts were not maximized to support organ func-

tion, indicate that, in more than 20 per cent of the instances in our study, there is a reluctance on the part of the physicians and the health care system to support donation of organs. Given an established rate of donation of 22 per cent for 1988, an additional eight donors might have been procured from the missed potential donor population had the potential for donation been recognized and pursued.

In 92 instances, the consent for donation was denied by the family. This high rate of denial is not predicated by public opinion polls, which show a broad based public awareness and support for organ donation (4, 5). Legislation in Kentucky mandated that hospitals establish procedures to ensure that families were given the option to donate when medically indicated. From our data, this would seem to have occurred as the option to donate was given to the surviving family in 135 occasions. Unfortunately, these presentations were successful only 22 per cent of the time. Thus, it would seem that legislation in favor of donation, while improving the process of identification, does not assure that those in the health care system understand how best to manage the request process. Because of this apparent dichotomy of support and lack of success, we studied the request process in detail.

Race, as a factor in the donation process, is difficult to assess from our data. Nonwhite donors comprised 8 per cent of deaths that occurred during 1988 and 10 per cent of the potential, with two patients actually becoming donors. Overall, there were only three nonwhite donors obtained from 20 potential donors during this two year study. Thus, our data suggests that, when nonwhite potential donors are identified, there is less likelihood that actual donation will occur when compared with whites.

The prime factors that did have a positive influence on donation were the clear separation of the notification of brain death and the request process. When the request for donation was made to a family that had an acceptance of brain death, a donation resulted in 53 of 93 instances. On the other hand, when there was not this clear acceptance of death, only 11 donors resulted from 62 requests. On 12 occasions, there was a known objection to organ donation by the decedent, and thus, no organs were obtained in this group, although the family accepted the death. The positive affect of separating brain death from the request process was noted even when the ten family-initiated instances were removed from the

comparison. In that analysis, a decoupled request still resulted in organ donation in 43 of 72 instances. This aspect of the request process has not been emphasized previously. The findings of one study could not demonstrate a relationship between the time of injury and the time of death; the inference being that the longer the time between injury and death, the more positive the organ donation response, because it would give the family more time to accommodate and accept the death (8). However, the specific time separation between the explanation of death and the subsequent request for organ donation was not evaluated in that study.

The personal role of the procurement coordinator in donor request is not clearly defined. Our data would suggest that participation of a coordinator has little effect on the over-all outcome. However, in the 89 instances when the organ procurement agency had knowledge of the potential for donation before the family was approached concerning donation, 68 of these requests were decoupled presentations. Therefore, it would seem that the procurement coordinator has a key position in timing and directing the request process.

Over-all, the number of donors procured in our service area has improved from 38 to 64 during a 12 month period. This is attributable, in large part, to the visibility within the major donor hospitals of this study and our emphasis on the decoupling of the request process. It is our impression that most physicians support organ donation and are quite interested in working with organ procurement agencies if that effort results in a positive experience and success. Our data reflect this positive effect of our ongoing contact and dialogue with physicians and hospital personnel. In the first 25 instances of our second phase study, there were eight donors and only ten decoupled requests, while in the last 25 instances, 13 donors were procured and all but five of the organ donor requests were separated from the explanation of death.

SUMMARY

A computerized review of death certificates and a subsequent on-site chart review of all deaths in the service area of the Kentucky Organ Donor Affiliates revealed that 173 potential organ donors occurred during a one year period. Thus, a rate of 50.8 donors per one million population base was established for a defined geographic region. Over-all, only 38 donors resulted from this po-

tential, and in 92 instances, a refusal by the family was the impediment to donation. A subsequent review of the donor request process in 155 consecutive potential donors identified one factor that was most important for a positive donation outcome. It was noted that the family must have time to understand and accept brain death before any request for donation to maximize the rate of procurement. When the separation of these family contacts took place, there was a 60 per cent success rate in the procurement of transplantable organs compared with 18 per cent when the request was coupled with the explanation of brain death.

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