

The Need for Organ Donation in Hawaii

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Donor organ availability is the primary limiting factor in organ transplantation. The number of patients on the national organ waitlist has increased to more than 32,000, while the number of donors has remained fairly constant at approximately 4,500 per year. In Hawaii, there are 98 patients awaiting organ transplants, and for the past 5 years, the average number of donors per year was 15. The criteria for organ donation, brain death, approaches to donation request, and the management of the multiple organ donor are discussed.

Introduction

The field of organ transplantation has made remarkable progress in recent years. Advancements in tissue typing, surgical techniques and immunosuppression have resulted in enhanced 1-year patient survival rates for kidney, heart, pancreas, and liver transplants. The advances in the field and resultant successes have led to a steady increase in the number of patients seeking transplants. The number of year-end registrations has been increasing since 1988, with annual increases ranging from 12% to 19%.¹ Overall registration on the United Organ Sharing Network (UNOS) waitlist has increased by 81% between 1988 and 1991.¹

This increase in the number of patients on the waitlist has not been matched by an increase in the number of organ donors. From 1988 to 1991, the total number of cadaveric donors

increased by only 11%.² Because the number of organ donors has not increased in proportion to the waitlist, waitlist mortality is increasing. One estimate is that 38% of patients awaiting heart, lung, or liver transplantation die before an organ becomes available.³

In Hawaii there are 98 patients on the transplant waitlist (Table 1). Many patients have been on the list for several years as the state averages less than 20 donors a year.

Nationally, the reasons for the shortage of organ donors include: 1) The family is approached and declines permission, 2) organ donation is not considered after the diagnosis of brain death has been made, 3) a failure to identify brain death, and 4) poor organ perfusion through donor instability. When the family

is approached and consent is declined, the following reasons have been given: Emotional, racial/ethnic and religious.²

The aim of this study was to examine the characteristics of the actual donors in Hawaii and compare them to national statistics. Discussion will be focused on the need to increase both the local and national donor pools, an explanation of brain death, approaches to donation request, and management of donors prior to organ procurement.

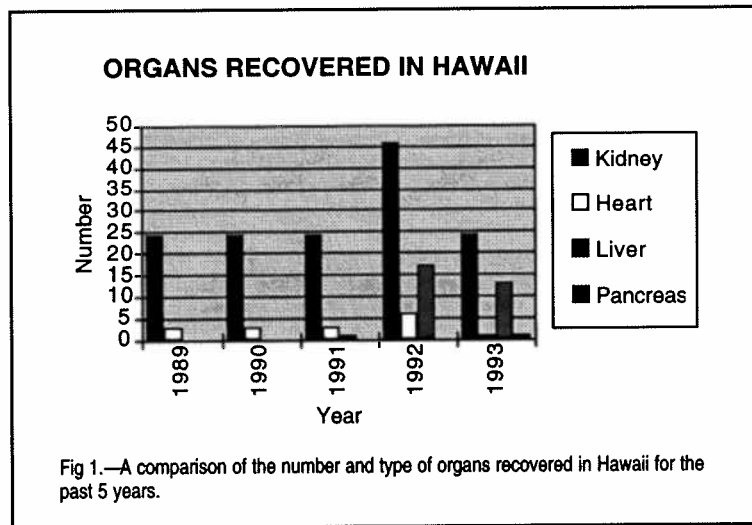


Fig 1.—A comparison of the number and type of organs recovered in Hawaii for the past 5 years.

Methods

The Organ Donor Center of Hawaii is a non-profit organization devoted to coordination of organ donation in Hawaii. It also educates the medical community and the general public about the importance of organ donation. This organization, like the 65 other organ procurement organizations in the United States, is funded by Medicare and private insurance.

A retrospective analysis was performed on all organ donors in Hawaii using records from the Organ Donor Center of Hawaii.

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To develop a profile of the donors in Hawaii, the following information was obtained for each patient: Age, sex, cause of death, ethnicity, hospital where donation originated, and organs donated.

Results

Over a 5-year period from January 1, 1989 to December 31, 1993, 75 organ donors were recorded in Hawaii. Table 2 indicates the number and age distribution of donors per year. The average age was 31; local donors reflected the national statistics in that a majority were from the 19 to 35 age group. Seventy-five percent of local donors were male; this majority was consistent with the national data (61.5%).² Over 50% of the local donors were Caucasian, with Japanese, Chinese and Filipino minorities represented (Table 3).

For organ donors in Hawaii, motor vehicle accidents were the most common cause of death. Nationally, this cause is ranked behind cerebrovascular accidents, which is thought to be due to improvements in the care of trauma patients and passage of safety laws governing the use of seatbelts and motorcycle helmets;² perhaps the higher ranking locally reflected the absence of mandatory helmet laws for motorcycle riders. Locally, other causes of death included cerebrovascular accidents, gunshot wounds, asphyxiation and drowning (Table 4).

Thirty of the donors were hospitalized at The Queen's Medical Center, where a large number of trauma patients are treated. As a result of advances in organ procurement and storage, hospitals on Neighbor Islands contributed to the donor pool (Table 5).

In the early stages of this review, only kidneys and hearts were recovered for transplantation. In 1991 the first liver was recovered; the first liver recovered and transplanted in Hawaii occurred in 1993. Another landmark in local medical history also occurred 1993 when the first pancreas was recovered and successfully transplanted (Fig 1).

Discussion

The biggest obstacle facing organ transplantation is the limited number of organ donors. It is estimated there are between 4,992 and 28,954 potential cadaveric organ donors nationally each year.⁴ The actual number of donors, however, has been fairly constant, with 4,516 donors in 1991.² Over the past 5 years, the state of Hawaii has averaged 15 donors per million of population a year. This is below the national average of 18 donors per million of population a year.

Criteria for organ donation

Organ donation should be considered when a patient is admitted with a life threatening or irreversible brain injury. The Organ Donor Center of Hawaii should be notified when a diagnosis of brain death is anticipated or has been made. Following declaration of brain death, consent for organ donation is obtained from the next of kin. Regardless of the patient's signature on a donor card or driver's license, no organs are removed without this consent. The involvement of the donation coordinator at this stage is crucial; these highly trained individu-

als can give families a clear and objective understanding of organ donation. Concerns regarding respect for the body and preservation of dignity, along with questions regarding funeral arrangements and viewing are of utmost importance to the grieving family. Donation coordinators are available 24-hours a day to assist the families, physicians and hospital staff throughout the donation process.

The ideal cadaveric donor is a previously healthy individual whose death is caused by an isolated, irreversible brain injury.⁵ To be considered, adequate circulation and oxygenation to the organs must be maintained. Absolute contraindications to organ donation are: Non-CNS malignancy, active infection (bacterial, fungal, viral, parasitic), or seropositivity for hepatitis, HIV, and HTLV-1. The upper age limit for organ donation is increasing; in Hawaii, liver and kidneys from donors as old as 66 years of age with adequate physiologic function have been removed for transplantation. The generally accepted upper age limit for heart donation in Hawaii is 45 years of age.

Brain death

Brain death is required prior to cadaveric organ donation. The specific criteria for brain death was initially addressed by the Harvard Commission in 1968, with other studies following.⁶ Currently, all 50 states have laws recognizing brain death.⁵ The current guidelines for determination of brain death are summarized in Table 6. In Hawaii, declaration of brain death by 2 physicians is required; one of the physicians usually is a neurologist or a neurosurgeon and neither physician may be a member of the transplant team.

After metabolic factors have been corrected, tests are administered to determine cessation of cerebral and brain stem activity. While the law permits declaration of brain death by clinical examination alone, confirmatory tests such as an EEG or a nuclear medicine brain flow study may be performed.

A brain dead patient is legally dead. This concept may be difficult for the public to grasp and is important to consider when discussing the timing of the request for organ donation. Families should not be approached about organ donation until after they have been told their loved one is brain dead and all questions are answered about this diagnosis. This concept is known as *decoupling*. After the families have had the chance to accept brain death as final and to grieve over the loss of their loved one, then the option of organ donation can be presented. Research has shown that by using the decoupling process, the consent rate from families nearly doubled.⁷

Donor management

If there are no contraindications to organ donation after the medical history is reviewed, the functional status of the various organs is evaluated with blood tests and hemodynamic monitoring. The brain dead patient is often hemodynamically unstable during the evaluation process. To ensure adequate perfusion of the organs, a central venous catheter or Swan Ganz catheter and a Foley catheter often are necessary to guide fluid management. The goal is to maintain normal or near normal oxygenation and perfusion of the organs being considered for transplantation.

Table 1 Patients on Transplant Waitlist in Hawaii

As of November 24, 1993

Kidney	90	Heart	4	Liver	3	Pancreas	1
Total	98						

Table 2 Donors by Age And Year in Hawaii

(1989 to 1993)

Age Bracket	1989	1990	1991	1992	1993
0 to 5				2	1
6 to 18	4	2	1	5	3
19 to 35	5	6	8	10	5
36 to 49	3	4	4	3	2
50 to 64				5	1
>65					1
Total Donors a year	12	12	13	25	13

Table 3 Donors by Ethnicity in Hawaii

(1989 to 1993)

Caucasian	44	(58%)
Japanese	8	(11%)
Chinese	4	(5%)
Filipino	3	(4%)
Local mix	5	(7%)
Other	11	(15%)
Total	75	(100%)

Table 4 Donors by Cause of Death in Hawaii

(1989 to 1993)

Motorcycle/Car	23	(31%)
Cerebrovascular	19	(25%)
Gunshot	9	(12%)
Other head trauma	11	(14%)
Asphyxiation	2	(3%)
Drowning	3	(4%)
Other	8	(11%)

Table 5 Donors by Hospital in Hawaii

(1989 to 1993)

Hospital	Number of Donors
The Queen's Medical Center	30
Kapiolani Medical Center	7
Straub Clinic and Hospital	7
Kaiser Permanente Medical Care Program	6
Tripler Army Medical Center	6
Maui Memorial Hospital	5
Castle Medical Center	4
Hilo Hospital	3
Kapiolani Medical Center at Pali Momi	3
St. Francis Medical Center	2
Kuakini Medical Center	1
Wilcox Memorial Hospital	1
Total	75

Table 6 Guidelines for Determination of Death

- Established in the absence of complicating metabolic factors, drug overdose, altered electrolyte, acid-base or glucose homeostasis, hypothermia (<32.2° C), or shock
- Etiology established, recovery excluded, persists on repeated examination

Neurologic Death

- Deep coma, cerebral unresponsiveness and unreceptivity
- Absence of brain stem functions
- No spontaneous respirations (apnea in the setting of hypercarbia)
- Reflexes are all absent: Pupillary light, oculocephalic (doll's eyes), oculovestibular (cold water calorics), oropharyngeal (gag), respiratory, and corneal

Cardiopulmonary Death

- Irreversible cessation of circulatory and respiratory functions

Over 70% of organ donors require treatment for diabetes insipidus and Pitressin is the most commonly used agent for this condition. Electrolytes are monitored frequently and corrected as needed.^{7,8}

When the blood test results are deemed acceptable, the patient is then taken to the operating room. The organs are perfused with cold preservation solutions prior to surgical removal; this is referred to as core-cooling. This is done by placing catheters in the infrarenal aorta and vena cava.⁵ Surgical removal of multiple organs follows this sequence: Heart, liver, pancreas, and kidneys.⁵

Once removed, the preservation of the organ can be prolonged using hypothermia either by means of simple cold storage or with a hypothermic pulsatile perfusion machine.⁵ With the use of preservation solutions and either hypothermic technique, a heart can be preserved for 5 hours, liver and pancreas up to 24 hours, and a kidney up to 48 hours after removal.

Summary

Organ transplantation, both locally and nationally, is limited by the lack of organ donors. This review of the profile of local organ donors revealed similar demographic information when compared to national statistics. In an effort to alleviate the organ shortage in Hawaii, the past 5 years showed an increase in the types of organs obtained for transplantation. In addition, organs from older donors are being transplanted. Further study is needed to determine the barriers to organ donation. Once identified, and appropriate action initiated, it is hoped that the number of transplants will increase and the waitlist mortality can be minimized through maximizing organ recovery.

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Description: Yohimbine is a 3a-15a-20B-17a-hydroxy Yohimbine-16a-carboxylic acid methyl ester. The alkaloid is found in Rubaceae and related trees. Also in *Rauwolfia Serpentina* (L) Benth. Yohimbine is an indolalkylamine alkaloid with chemical similarity to reserpine. It is a crystalline powder, odorless. Each compressed tablet contains (1/12 gr.) 5.4 mg of Yohimbine Hydrochloride.

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Indications: Yocon[®] is indicated as a sympatholytic and mydriatic. It may have activity as an aphrodisiac.

Contraindications: Renal diseases, and patient's sensitive to the drug. In view of the limited and inadequate information at hand, no precise tabulation can be offered of additional contraindications.

Warning: Generally, this drug is not proposed for use in females and certainly must not be used during pregnancy. Neither is this drug proposed for use in pediatric, geriatric or cardio-renal patients with gastric or duodenal ulcer history. Nor should it be used in conjunction with mood-modifying drugs such as antidepressants, or in psychiatric patients in general.

Adverse Reactions: Yohimbine readily penetrates the (CNS) and produces a complex pattern of responses in lower doses than required to produce peripheral a-adrenergic blockade. These include, anti-diuresis, a general picture of central excitation including elevation of blood pressure and heart rate, increased motor activity, irritability and tremor. Sweating, nausea and vomiting are common after parenteral administration of the drug.^{1,2} Also dizziness, headache, skin flushing reported when used orally.^{1,3}

Dosage and Administration: Experimental dosage reported in treatment of erectile impotence.^{1,3,4} 1 tablet (5.4 mg) 3 times a day, to adult males taken orally. Occasional side effects reported with this dosage are nausea, dizziness or nervousness. In the event of side effects dosage to be reduced to 1/2 tablet 3 times a day, followed by gradual increases to 1 tablet 3 times a day. Reported therapy not more than 10 weeks.³

How Supplied: Oral tablets of Yocon[®] 1/12 gr. 5.4 mg in bottles of 100's NDC 53159-001-01 and 1000's NDC 53159-001-10.

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