

The Donation of Human Organs and the Evolving Capacity for Transplantation: Exciting Developments and Future Prospects

Erika L. Rager, MD, MPH

Solid organ transplant is the best treatment and only cure for many people suffering from end-stage disease. Over the past 20 years, improvements in immunosuppression and increasing experience in caring for transplant patients has resulted in massive increases in the use of this therapy. Now, the numbers are truly staggering. As of December 15, 2003, there were 83,686 patients with end-stage organ disease awaiting transplant in the US. In 2002, there were 12,801 deceased and living organ donors; 24,900 patients underwent transplantation; and 6,187 died while waiting on the list.¹ About 56 people receive an organ transplant every day in the US and four North Carolinians die each week waiting for an organ transplant. The therapeutic application of organ transplantation is limited only by a shortage of donor organs.

Brief history of organ transplantation

Development of organ transplantation as a widely applicable therapy depended on technical advancements in the field of surgery and increased understanding of immune function. The initial technical advancements in vascular anastomosis (surgical techniques to sew together blood vessels) that were necessary for later organ transplantation were developed by French surgeon Alexis Carrel in the early 1900's. Animal studies over the next 50 years resulted in techniques for the transplantation of kidneys, abdominal and thoracic organs.²

Based on studies of skin grafting, by the 1940's scientists understood that rejection of transplanted tissues was an immunological event. Initial attempts to modulate the immune system in humans used sublethal doses of total body irradiation to suppress bone marrow production of white blood cells. This immunosuppression led to occasional long-term survival of transplanted organs, but was unreliable. By the early 1960's, researchers were using drugs to suppress the bone marrow. Medication regimens based on azathioprine and prednisone improved patient survival in the 1960's and 1970's, especially for living-related kidney transplants.^{2,3} In the late

1970's, the immunosuppressive drug cyclosporine was introduced. Cyclosporine dramatically changed the course of organ transplantation. One-year survival rates increased from 30-60% to 70-90%.⁴ Transplantation of kidneys, livers, hearts, and lungs became widespread.

The first transplant that enjoyed long-term success was a living-related renal transplant performed between identical twins in 1954 by Dr. Joseph Murray. In 1990, Dr. Murray was awarded the Nobel Prize for Medicine for his achievements in the field of transplantation. Aside from the first successful renal transplant in 1954, most of the first successful solid organ transplants occurred in the late 1960's.

Table 1.
Milestones in Transplantation in North America

1954	First successful kidney transplant
1966	First successful kidney-pancreas transplant
1967	First successful liver transplant
1968	First isolated pancreas transplant
1968	First successful heart transplant
1981	First successful heart-lung transplant
1983	Cyclosporine receives FDA approval
1983	First successful single lung transplant
1986	First successful double lung transplant
1989	First successful living-related liver transplant
1990	First successful living-related lung transplant

Source: Adapted from www.optn.org

Organ procurement and preservation, tissue matching, and immunosuppression are the principal ingredients for successful solid organ transplantation. The technical aspects of the organ procurement operation allow multiple teams to work together to procure all useful organs from a single donor. Modern preservation fluids increase the length of cold ischemic time (time outside the donor's body for transport to the recipient)

Erika L. Rager, MD, MPH, is a Preventive Medicine resident in the Department of Social Medicine and General Surgery resident in the Department of Surgery at the University of North Carolina at Chapel Hill. She can be reached at rager@email.unc.edu or Department of Social Medicine, CB#7240 Wing D, UNC-CH, Chapel Hill NC, 27599-7240. Telephone: 919-843-8077.

that an explanted organ can tolerate. Preservation fluids are ice-cold solutions that include electrolytes, antioxidants, hydrogen ion buffers and sugars.⁵ Appropriate tissue matching depends on blood group matching (e.g. blood type A, B, or O) for all organs. Kidneys are also tissue-matched based on HLA (human lymphocyte antigen) type and lymphocyte (white blood cell) cross-matching tests.² Cross-matching mixes the recipient's serum with the donor's lymphocytes to test immunologic compatibility. Today's immunosuppressive regimens typically include three drugs: a glucocorticoid such as prednisone, an antimetabolite such as azathioprine or mycophenolate, and a calcineurin inhibitor such as cyclosporine or tacrolimus.

Table 2.
ABO Blood Type Compatibility

Transplant	Acceptability
O to non-O	Safe
Rh- to Rh+	Safe
Rh+ to Rh-	Relatively safe
A to non-A	Dangerous
B to non-B	Dangerous
AB to non-AB	Dangerous

Source: Adapted from Starzl, World J Surg 2000

STRUCTURE OF THE NATIONAL ORGAN PROCUREMENT AND TRANSPLANTATION SYSTEM

Current Scope of Solid Organ Transplantation

Solid organs that are transplanted in the US include kidney, liver, heart, lung, pancreas, and small intestine. There is an allocation policy specific to each donor organ. Potential recipients are listed based on objective criteria that include blood type, tissue type, size of organ needed, medical urgency of the recipient, time on the waiting list and distance between the donor and recipient.¹ The process of identifying potential organ donors, placing their organs with appropriate recipients and coordinating the transplant operations is a complicated process involving many organizations working together.

Organ Procurement and Transplantation Network

The Organ Procurement and Transplantation Network (OPTN) was created by the National Organ Transplant Act of 1984. The OPTN facilitates organ matching. It develops policies and procedures for organ recovery, allocation, and transportation. It also collects, manages and distributes data about organ transplantation. Finally, it provides both professional and public education about organ donation and transplantation. In order to receive Medicare funds, all transplant centers and OPO's must be members of the OPTN. The OPTN has a variety of other members, including independent histocompatibility laboratories, professional organizations, patient advocacy organizations and members of the general public.¹

All organ transplant programs in the US are members of the OPTN. Members of the OPTN are certified as compliant with the rules that are in place to ensure the public safety, and highest level of care for organ donors and recipients. The OPTN membership bylaws explicitly outline the requirements for a transplant center. Program staffing requirements include a medical director, clinical transplant coordinator (usually a nurse), financial coordinator, and staff to provide social support.

Transplant centers must have specially-trained transplant surgeons and transplant physicians with extensive qualifications. The OPTN also monitors survival rates at each transplant center, and those who fall below a given threshold level are reviewed.^{1,6}

United Network for Organ Sharing

The United Network for Organ Sharing, or UNOS, is a private, nonprofit organization that contracts with the federal government to administer the Organ Procurement and Transplantation Network. The centralized computer network at the UNOS Organ Center links OPO's and transplant centers. All patients on the transplant waiting list are registered with UNOS.¹ On average, UNOS receives 350 calls per day from OPO's.⁷

Regions

The US is divided into 11 regions. North Carolina is in Region 11, along with Kentucky, South Carolina, Tennessee and Virginia.

Organ Procurement Organizations

Organ Procurement Organizations (OPO's) are private, nonprofit organizations that are members of the OPTN and certified by the Health Resources and Services Administration. Each OPO has its own board of directors and medical director, usually a transplant surgeon or physician. Procurement coordinators work for the OPO. They are highly trained professionals, often nurses, who coordinate each step of the transplant process.

The OPO's are involved in every step of a deceased-donor (cadaveric) organ transplant, from evaluating potential donors, to obtaining consent from the donor's family, placing the organs and traveling with the procurement team to obtain the organs. The OPO's other primary role is to promote organ donation within the community. They engage in public and professional education efforts in the community and in the hospitals they serve.

The OPO's have defined service areas designed to assure maximum effectiveness in organ procurement and equitable distribution of organs. There are currently 59 OPO's. The OPO's serve all the hospitals in their designated geographical areas. North Carolina is served by two OPO's. Carolina Donor Services serves 79 counties in North Carolina, and Danville, Virginia. LifeShare Of the Carolinas serves 23 counties in south-western North Carolina and York County, South Carolina.^{1,8,9}

LEGISLATIVE HISTORY

Uniform Anatomical Gift Act

The Uniform Anatomical Gift Act (UAGA), promulgated in 1968, established the legal framework for organ donation. A version of the UAGA was adopted in each state and the District of Columbia. The scope of the act is limited to organ procure-

ment. It requires hospitals to establish affiliations with regional organ procurement organizations to coordinate the procurement of organs. The UAGA holds that all citizens aged 18 and over have the right to decide for themselves if they choose to be organ donors. It established the Uniform Organ Donor Card as a legal document. The law does not require the consent of next of kin for the procurement of organs from a brain dead patient with written documentation of intention to donate, such as a signed donor card or driver's license.¹⁰ However, in practice, the OPOs require consent from the patient's family prior to organ donation. The law also establishes the order of priority in obtaining consent: spouse; adult son or daughter; parent; adult sibling; grandparent; and legal guardian.¹

National Organ Transplantation Act

In 1984 Congress passed the National Organ Transplant Act (NOTA). This act established the Organ Procurement and Transplantation Network (OPTN). The OPTN has two primary goals: to increase the effectiveness and efficiency of organ sharing and equity in the national system of organ allocation; and, to increase the supply of donated organs available for transplantation.¹ NOTA also expressly forbids the buying or selling of organs.

The US Department of Health and Human Services, through the Health Resources and Services Administration, contracts with a private, nonprofit organization to operate the OPTN. Since 1986, the United Network for Organ Sharing (UNOS), based in Richmond, Virginia, has administered the OPTN. UNOS operates the national wait list.

Omnibus Budget Reconciliation Act

A 1986 amendment to the Social Security Act requires hospitals that receive Medicare or Medicaid funding to have written protocols for the identification of potential organ donors and notification of the local OPO. It also requires hospitals to make families aware of the option to donate or to decline to donate. Transplant hospitals are required to be members of the OPTN and abide by the Network's rules. Finally, it added limited coverage for immunosuppressive drugs for Medicare patients.^{1,8}

Medicare ESRD Program

Prior to the 1960's, End-Stage Renal Disease (ESRD) was a certain death sentence. In that decade, two powerful treatment options emerged: dialysis and transplantation. Congress created the ESRD Program in 1972. It covers most medical care for almost all ESRD patients. When the program was created, there were 10,000 eligible patients. By 2000, there were over 323,000 patients receiving treatment for ESRD. This number is expected to continue to grow rapidly. Current estimates are that in 2010, there will be 651,000 ESRD patients.¹¹ For those patients for whom it is medically appropriate, transplantation is preferable to dialysis. It leads to longer life expectancy, better quality of life, and lower costs than dialysis.¹²

Other Legislation

In 1998, the US Department of Health and Human

Services made changes to the Conditions of Participation for hospitals that receive Medicare and/or Medicaid funding in an attempt to increase organ donation. Hospitals are required to notify the local OPO of all deaths or imminent deaths. The individual who initiates family discussions about organ donation must be a representative of the local OPO or someone who has been specially trained to request organ donation.⁸ This is not typically a physician. Decoupling the discussions about brain death and organ donation is thought to increase the consent rate. Requests for organ donation that come from someone specially trained, such as an OPO representative, are also thought to increase consent rates.

This year the Organ Donation and Recovery Improvement Act was introduced in the US Senate. If passed, it would fund a public education campaign and hospital organ donation coordination programs. It would also allow reimbursement to organ donor families for travel and subsistence expenses. However, the idea of providing reimbursement to donor families is controversial and in contradiction to the National Organ Transplantation Act.

North Carolina Legislation

The "Gift of Life Act," passed in 1997, requires hospitals to notify the local OPO of all cardiac deaths or impending brain deaths of patients up to age 75. It also designates OPOs as responsible for evaluating all referrals for potential donation and informing families of the option to donate.

THE PROCESS OF ORGAN DONATION AND TRANSPLANTATION

When a transplant center initially decides that a patient with end-stage disease is appropriate for transplant, the potential organ recipient's name and medical information are entered into a computer database at the UNOS Organ Center. At this point, the patient has been "listed" for transplant. The potential transplant recipient then waits on the list until a donor organ becomes available. As the waiting lists grow longer, so do the waiting times. Almost half of all transplant candidates in North Carolina who are waiting for kidney or heart transplants have been waiting more than two years. More than half of those waiting for liver, lung, and heart-lung transplants have been waiting more than two years.¹

Brain Death

The donor process begins when a local OPO is contacted by a hospital caring for a patient with impending brain death. The vast majority of organs procured from deceased donors come from donors who have sustained brain death under circumstances that allow their respiration and circulation to continue to be supported by artificial means. The acceptance of organ procurement for transplantation depends on understanding the concept of brain death. Under the Uniform Determination of Death Act,¹³ drafted in 1980 and adopted by 43 states, death is defined as either irreversible cessation of circulation and respiration, or irreversible cessation of all brain and brainstem

function.⁸ Prior to the declaration of brain death, several other diagnoses must be ruled out, including hypothermia, circulatory shock, drug intoxication, metabolic intoxication from kidney or liver failure, and the prolonged effects of neuromuscular blocking drugs.¹⁴

A physician must certify a patient as brain dead in order for that patient to be an organ donor. The criteria for diagnosing brain death vary from hospital to hospital, but they include some combination of physical exam and other tests. The usual tests include reflexes such as gag, cough and pupillary response to light. An apnea test is performed to determine that the patient cannot breathe without mechanical assistance. A cerebral blood flow test may also be performed to determine whether or not there is blood flowing to the brain.⁸

Brain death can be caused by any condition that interrupts oxygen delivery to the brain. Such conditions include trauma, stroke, intracranial bleed, drowning, carbon monoxide poisoning, drug overdose and others.⁸ The most common causes of death for organ donors are head trauma, cerebrovascular accident (stroke), and anoxia (lack of oxygen supply to the brain).¹

Potential organ donors undergo physiologic changes that require aggressive medical management prior to and after the declaration of brain death. Medical interventions are often required to maintain adequate intravascular volume and blood pressure; maintain body temperature; correct coagulopathy (bleeding disorders); avoid elevated intracranial pressures; and treat hormone imbalances such as diabetes insipidus. The most common complication, occurring in up to 91% of patients, is hypotension (low blood pressure) requiring invasive monitoring and/or support with vasopressors (medicines to increase blood pressure). Timely determination of brain death is important to protect the condition of the donor's organs. A rapid brain death determination protocol can reduce medical failures prior to organ donation and can increase consent rates for donation. It can also increase the number of organs procured per donor to a level well above the national average.¹⁴

Organ Allocation and Procurement

After the declaration of brain death, the donor OPO performs a medical evaluation and contacts the patient's family to discuss organ donation. Once the family agrees to donation, the procurement coordinator from the OPO takes over medical management of the donor. At the same time, the coordinator contacts the UNOS Organ Center to begin the process of organ placement.

Each time a donor organ becomes available, the UNOS computer compares characteristics of the donor with each individual waiting for that type of organ. The computer then generates a list of potential organ recipients, the "match-run" list, ranked in order based on characteristics such as blood type, body size, medical urgency, waiting time and location. Factors such as race, religion, gender and financial status do not enter into the equation.⁸

The allocation policy is somewhat different for each organ. In general, organs first are offered to patients awaiting transplant within the OPO in which the organs were donated. They are then offered regionally and nationally. Some organs are offered based on recipient distance (in air miles) from the donor hospital. This policy decreases organ preservation time, thus improving organ quality and recipient outcomes. It also reduces costs to the transplant patient and provides more equitable geographic access to transplantation.¹

Once the match list is available, the procurement coordinator contacts the transplant team caring for the patient at the top of the list. The transplant surgeon determines whether or not the organ being offered is appropriate for that patient. If so, the organ procurement and transplant operations are scheduled. If not, the procurement coordinator moves to the next patient on the list, calls that patient's transplant team and offers the organ. This process continues until all the available organs from a given donor are placed with transplant recipients.⁸

The accepting transplant teams travel to the donor's hospital, where the procurement operation takes place. Transplant teams from widely separated centers can share organs from a common donor. Surgical techniques allow any combination of organs to be removed. Preserving solid organs depends on rapid intravascular cooling done in situ (in the body), followed by removal of the organs, storage of the organs in ice-cold preservation fluid and rapid transport to the recipients' hospitals.² The cold ischemic time is the length of time the organs are on ice, without blood flow. The maximum cold ischemic time limits the amount of time that can pass between organ recovery and the organ transplant.

UNOS functions as the middle-man between the donor OPO and the receiving OPO. The donor OPO receives the match-run list, but does not have access to information about other patients who are listed for transplant. The receiving OPO

can access wait lists for the hospitals that they serve, but cannot see the match-run list. This system was put into place to prevent individual transplant centers from manipulating the donor system.⁷

From the time consent for organ donation is obtained, all costs incurred in the donation process are billed to the OPO.

Table 3.
Maximum Cold Ischemic Time

Organ	Preservation Time
Heart and Lungs	4-6 hours
Liver	12-24 hours
Kidney	48-72 hours
Pancreas	12-24 hours
Small Intestine	12 hours

Source: Adapted from www.lifesharecarolinas.org and Punch, JD.

INCREASING THE NUMBER OF ORGANS FOR TRANSPLANT

One of the biggest challenges facing the transplant community at this time is a stagnant number of deceased donors in the face of an ever-increasing need for donor organs.

A number of options for expanding the pool of available organs exist. Increasing the rate of consent by families of potential

donors could expand the pool of deceased donors. Policy changes in consent for organ procurement may increase available organs. Increased use of living donors for kidney, liver and lung transplants is an attractive option, although this practice is debated as it exposes otherwise healthy people to risk of morbidity and mortality. Compensation to donor families, once taboo, is now being debated. Technical changes include

that efforts to increase donation should be concentrated at these larger hospitals.

In March of 2002, Carolina Donor Services surveyed residents in the counties that it serves in an attempt to better understand residents' attitudes and awareness concerning organ donation. They found that families, friends, medical providers and clergy were most likely to influence the intention to be an

organ donor. While 97% agreed that "organ donors provide the gift of life" and 93% agreed that "people are dying because there aren't enough organs available," only 56% intend to donate their organs when they die. As compared to whites, African Americans are more likely to be unsure about donating (45% vs. 22%) and are more likely to be opposed to organ donation (21% vs. 12%).⁸

The main factors that motivate North Carolinians to be organ donors are a sense of altruism and practicality. The chance to help someone else or save a life motivates 65% of donors, while 29% say that they intend to be a donor because "I don't need organs when I die." The most commonly reported reason people decide not to be donors is that they think they

are too old or unhealthy to donate (26%). Other common reasons are that they never thought about it (19%) or that they are uncomfortable with the idea (15%).⁸ Carolina Donor Services used the results of this survey to plan educational interventions to increase organ donation.

Carolina Donor Services also found that only 63% of people know that major religious groups support organ donation. In fact, all major religions in the US support organ donation and transplantation.⁸

Consent Procedures

The current donor system depends on a patchwork of organ donor cards, driver's licenses, advanced directives, and durable power of attorney for healthcare statements as vehicles for citizens to state their wishes. This is an "opt-in" system; it depends on routine referral of all potentially medically eligible donors to the local organ procurement organization (OPO). Trained professionals from the OPO then initiate contact with the patient's family regarding potential donation. The OPO attempts to ascertain the patient's wishes from documentation and discussions with the family. Even if the potential donor indicated his or her wish to donate, consent is still obtained from the family.

Eighty two percent of Americans believe that the individual, rather than his/her family, should make the decision regarding organ donation. Unfortunately, the same study found that 58% of Americans were unsure about their plans to donate or not to donate after death (30% intended to donate and 12% intended not to donate) and only 38% had discussed their plans with their families.¹⁶

These numbers are important because, in practice, the OPOs place tremendous weight on the family's wishes when obtaining consent for organ donation. A survey of all OPO's

Table 4.
Patient Waiting List for Organ Transplants as of January 21, 2004

Organ Needed	Patients in US	Patients in NC
Kidney	56,519	1,945
Liver	17,283	687
Lung	3,915	220
Heart	3,542	73
Kidney-Pancreas	2,417	96
Pancreas	1,527	15
Heart-Lung	189	17
Intestine	171	1
Total	83,570	2,965

Source: www.optn.org

expanded donor criteria and non-heartbeating donors. Biological research aimed at xenotransplantation (animal-to-human transplantation) is ongoing, but this is not currently a viable solution.

Missed Donors

Over the past 10 years, between five and six thousand organs were procured from deceased donors each year. However, it has been unclear how many potential donors are available but do not donate. Recently, the Association of Organ Procurement Organizations published a large study¹⁵ that indicates 54% of those families asked to donate agreed to do so. Only 42% of potential donors actually became donors. From 1997-1999, it is estimated that about 13,500 potential donors were available each year; this appears to be a stable pool of potential donors. There were about 5,500 actual donors each year. The population base for this study was large, and it probably accurately represents what is happening nationwide. However, the OPOs in the Southeastern United States did not contribute any data to this study.

Increasing the consent rate among potential donor families is one way to significantly increase the number of organs available. In fact, if all potential donors became actual donors, there would be enough hearts and kidneys available to transplant each person added to the list in 2002.¹⁵ This study offered important insight into how this goal might be accomplished. Families of brain dead patients were less likely to donate if the patient was older, non-white or died from a cause other than trauma. Moreover, 89% of potential donors and 91% of actual donors were cared for at hospitals with 150 or more beds; 88% of potential donors who did not ultimately donate were cared for at these larger hospitals. That indicates

found that 48% rank impact on the deceased's family as the most important factor when obtaining consent, while only 12% rank the deceased patient's wishes as the most important factor.¹⁷

Other Options for Consent

Some European countries approach consent for organ donation via an "opt-out" system. Citizens are presumed to consent to donation unless they explicitly state that they do not want to be donors. Spain, Austria, France, Portugal, and Belgium have presumed consent policies. The British Medical Association favors such a policy in the United Kingdom.

The Belgian system serves as an interesting example. It allows any citizen to register his objection to donation at the local town hall. A national database tracks those who have opted-out; less than two percent of Belgian citizens have done so. Doctors ask the patient's family to confirm the fact that the patient did not object, rather than asking the family to make the decision to consent to donation. The system also allows physicians to defer procurement for any valid reason. This system, enacted in 1986, led to an increase in the number of organ donors and an increase in the number of organs procured per donor.¹⁸

Mandated choice is a system that compels competent adults to decide whether or not they wish to be organ donors when they die. The decision could be required when obtaining a driver's license or filing a tax return. Under this system, each person must consider the issue and make a decision; the individual's decision is honored at the time of death.¹⁶

A Gallup poll conducted in 1993 provides the most recent evidence on public opinion regarding mandated choice. Thirty percent of those surveyed had signed organ donor cards. When asked if they would sign up to donate if mandated choice became law, 63% said yes.¹⁶ Based on the results of this survey, mandated choice would increase the number of available organs. Given that 82% of people think that the individual rather than his family should make the decision about organ donation, and that under mandated choice the individual's decision would be binding, mandated choice could protect individual autonomy while also sparing the potential donor's family an important decision at a difficult time.

A more subtle finding in this study is that the more one thinks about organ donation, the more likely s/he is to donate. Of the 25% who previously gave organ donation serious thought, 76% decided to donate.¹⁶ It appears that mandated choice could further increase organ donation simply by encouraging people to consider the issue on a regular basis. A recent online experiment supported this finding.¹⁹

The American Medical Association Council on Ethical and Judicial Affairs and the United Network for Organ Sharing both endorse mandated choice.

Living Donors

One viable option for increasing the number of organ donors is to increase reliance on living donors. In 2001, for the first time ever, there were more living kidney donors than deceased kidney donors. That trend continues. In addition to kidneys, livers, lungs, small intestines and pancreases are available from living donors. Living donors may be related, unrelated loved ones, or strangers. They are usually aged 18-60, physically fit and in good health. They must have a blood type that is compatible with the recipient.¹

Living donation is handled at the transplant center doing the transplant, rather than through OPOs and UNOS.¹ If the recipient has private health insurance, the costs of living donation are usually covered. Medicare covers the costs of living donation for donors whose recipient is covered under the End-Stage Renal Disease program.

Living donation is common for kidneys. Portions of liver and lung are transplanted with increasing frequency, while living donor pancreas and small intestine transplants remain rare. Use of organs from living donors can be controversial because the process exposes an otherwise healthy person to the risks of a donor operation. For this reason, the evaluation and consent of living donors requires special care. In particular, the transplant center must ensure that the donor's decision is voluntary. The transplant center must disclose all potential risks and benefits to the donor and recipient, including information on medical uncertainties and any alternative treatments for the recipient.²⁰

Some European countries approach consent for organ donation via an "opt-out" system. Citizens are presumed to consent to donation unless they explicitly state that they do not want to be donors.

Prior to donating an organ, a potential donor should undergo psychosocial evaluation by a mental health professional with special training in transplantation. This evaluator should not be involved in caring for the potential recipient. The goals of psychosocial evaluation are to evaluate social and emotional stability, establish competence to give informed consent, and to ensure that the decision to donate is made without coercion.²⁰ With these safeguards in place, living donation is a good way to increase the number of organs available for transplant.

The vast majority of experience with living donors is in kidney transplant. Kidneys transplanted from living donors have better outcomes than kidneys transplanted from deceased donors. The organs function better and longer. In fact, the half-life (the time until half of all organs stop functioning) is 21.6 years for organs from living donors, as compared to 13.8 years

for organs from deceased donors. Kidney donation has low rates of complications for the donor, with perioperative morbidity of 1-1.3% and mortality of 0-0.03%.²¹

The UNOS Board of Directors recently endorsed new initiatives to increase donation by living donors. These include coverage under the Family Medical Leave Act and a proposal to reimburse living donors for wages lost during the recovery period following transplantation.¹

Compensation for Donors

The National Organ Transplant Act prohibits the sale of organs. For many years, the transplant community was uniformly opposed to the idea of compensating donors. Organ donation is seen as dependent on intangible benefits to the donor's family—a way to create some good from a personal tragedy, gain meaning from death, contribute to the good of society and honor a loved one's wishes.²²

In recent years there has been a shift in perspective. The possibility of compensating organ donors is now frequently debated by medical professionals and ethicists. A UNOS telephone survey performed in 1990 found that the public was almost evenly split on whether or not organ donors should be compensated in some form. The state of Pennsylvania recently enacted a program whereby \$300 is paid directly to the funeral home to help defray the costs to families of organ donors.²³ Perhaps efforts to increase the tangible benefits of organ donation could increase the rate of donation.

Other Options for Increasing Organ Supply

Expanded donor criteria refers to the use of organs from donors who previously have been considered medically unacceptable. Expanded criteria include using donors at extremes of age or those with underlying medical illnesses that make them suboptimal donors. It may also include using organs from donors with active infection or colonization, those who have been poisoned, or those who were transplant recipients prior to death. Organs from donors with hepatitis B or C infection can be transplanted into recipients with those infections.²⁴ As experience with donors previously thought to be unacceptable grows, what constitutes an "acceptable" donor continues to change.

Some technical factors can also contribute to increasing the number of organs available. Kidneys from donors less than five years of age have been considered unusable. However, if they are transplanted *en bloc*, giving two small kidneys to the recipient, outcomes are good. Sometimes a donor liver can be split, thus providing livers for two recipients from one donor organ.²¹ Organs,

especially kidneys, can be procured from non-heartbeating donors. This is also known as controlled donation after cardiac death. It is a more complicated procedure and outcomes are not as good as when organs are obtained from brain dead donors.²⁴

Xenotransplantation, the use of tissue from an animal donor, may one day provide a solution to the chronic shortage of donor organs. It is not yet a viable option because the human immune response to the animal organ cannot be well-controlled. Also, the potential risks of infectious disease transmission from the animal to the human are poorly understood. In the past, nonhuman primates have been used experimentally to provide organs. In the future, pigs seem most likely to supply organs for transplant because there are fewer ethical concerns than with primates and because they breed quickly. Laboratory research continues and clinical trials may begin soon.²⁵

Conclusions

Efforts to increase organ donation continue. Carolina Donor Services recently partnered with UNC Hospitals and Pitt County Memorial Hospital to engage in an initiative by the US Department of Health and Human Services called the "Organ Donation Breakthrough Collaborative." The collaborative will apply best practices of organ donation processes to attempt to increase donation rates to 75%.⁸

Many people are hard at work developing ways to increase the number of organs available for transplantation. For the time being, education and policy efforts aimed at increasing the consent rate for deceased donation appear to offer the most hope. Consent to donate organs usually occurs in concert with an unexpected, tragic death. Organ donor cards and driver's license notations are an important part of organ donation policy. However, family discussions about organ donation prior to an unexpected tragedy are the best way to spare the family a difficult decision and insure that the patient's wishes are respected.

Transplantation is the best hope for many people with end-stage organ disease. And it works. Each year since 1988, the number of patients surviving more than one year after transplant has increased. The future of organ transplantation, and the future of those waiting for transplants, is limited only by a shortage of donor organs.

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Table 5.
Solid Organ Transplants in 2002

	Patients in US	Patients in NC
Patients who received transplants in 2002	24,897	701
Patients who died while waiting in 2002	6,391	210

Source: Adapted from www.carolinadonorservices.org

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WEB RESOURCES

www.optn.org
www.unos.org
www.carolinadonorservices.org
www.lifesharecarolinas.org
www.organdonor.gov
www.shareyourlife.org

I, _____, have spoken to my family about organ and tissue donation. I wish to donate.
☐ Any needed organs and tissue ☐ Only the following organs and tissue

The following people have witnessed my commitment to be a donor.

Donor Signature _____ Date _____

Witness _____ Date _____

Witness _____ Date _____

Public Information/Referral
800-200-2672 • 800-252-2672


Carolina Donor Services

DONOR CARD
Fill out this donor card in the presence of two witnesses, preferably your next-of-kin, and sign your name in the space provided.