The field of modern organ transplantation began in 1954 with the first successful kidney transplant by Joseph Murray and other surgeons at Boston's Bent Brigham Hospital. The first successful heart transplant was by Christian Barnard, in 1967, at Schur Groot Hospital in Cape Town, South Africa. The major technical barrier to successful organ transplantation has been the immune response to foreign tissue but this problem has yielded somewhat to the development of effective immunosuppressant drugs that have allowed patients to survive for years after their transplants rather than days. Another important technical advance was the development of the heart-lung machine that kept patients alive during the often lengthy operation. Over 20,000 organ transplants are performed each year (mostly kidneys, livers, and hearts, in that order).

The routine performance of organ transplantations has raised many questions for medical ethicists. The most fundamental issue is whether it is morally acceptable to use the organs of one person to keep another alive. The harvesting of organs from cadavers raises a delicate issue about determination of death since organs are likely to function better if removed quickly. One of the most harrowing ethical issues involves decisions as to who should receive scarce organs and who should not. The scarcity of organs raises the further issue of whether, in a rational society, people who could theoretically save many lives with their donated organs should be free not to donate them. If they are, how can the number of organs ever match the demand? Should the sale of organs ever be permitted? Is it ethical to raise, or to genetically engineer, animals whose sole purpose is to provide organs for transplantation into humans?

Consent of the Donor

From one point of view, the ethics of organ donation from a deceased person, who had consented, to another in need of the organ is relatively simple. There is generally no cost to the donor and there is a great benefit to the recipient in the sense that their life may be prolonged. Yet, some religious traditions have strong taboos against dissecting cadavers. Jewish religious law forbids mutilation of the dead but modern Jews have made some accommodation by accepting removal of an organ after death if a life can thereby be saved. Belief in reincarnation, or resurrection, as in the case of Buddhists and Muslims, respectively, means that these traditions are generally opposed to dissecting cadavers. Yet, in most of the relevant countries, the right of the individual to provide consent for removal of their organs after death is respected and transplants can therefore be ethically performed.

One of the most fundamental ethical consequences of organ transplantation has been a need to redefine death. The traditional definition of death was irreversible cessation of heartbeat, pulse, and breathing. This was a problem for the harvesting of organs because the loss of oxygenated blood flow produced rapid damage that quickly rendered the organs useless for transplantation. A new definition of death introduced by the President's Commission for the Study of Ethical Problems in Medicine in 1981 states that death occurs either with irreversible loss of respiration or irreversible loss of brain function. This has meant that organs can be harvested from people after their brains had died while their bodies were still "alive" thanks to the use of heart-lung machines to sustain respiration.

The biggest practical problem in organ transplantation is the scarcity of donated organs and this has led to considerable ethical discussion about whether the taking of organs from cadavers requires consent. Some ethicists feel that consent must come from the donor before death. The U.S. Uniform Anatomical Gift Act of 1968 allows potential donors to sign a contract that authorizes the taking of their organs after death. Moreover, in the case of deceased individuals who had not expressed opposition to being a donor, family members may authorize the taking of organs.
Strictly utilitarian ethicists take the point of view that all organs of cadavers should be harvestable. The organs of dead people will simply decay and be of no use to humanity. Meanwhile great human misery is created by an artificial scarcity of transplantable organs. One rational way to produce the greatest happiness of the greatest number of people is compulsory universal donation. A more moderate position recognizes that taking organs without consent can produce societal harm because it could undermine the inviolability of the body before death. For example, the needs of a dying person might take second place to the desire to spare his, or her, organs. Moreover, people belonging to religions that credit reincarnation might have strong feelings of oppression and outrage creating social unrest. The legal situation in France is more nearly utilitarian than that in the United States because French law assumes consent to organ donation in the absence of dissent either from the donor while still alive or from the family after death.

Selling Organs and Nonhuman Sources

The continued scarcity of organs suggests that there is some deep-seated objection to donation that may reflect limitations to human altruism. Just as few people bequeath their property to complete strangers, there may be a disinclination to give organs to unknown individuals. The most obvious way around this obstacle is to have a market in which transplantable organs are bought and sold. If it is possible to sell blood, semen, and human eggs, according to this view, what possible objection could there be to selling organs? One objection, articulated most often in Britain where commercial blood donation is not allowed, is that the opportunity to engage in a truly altruistic act is a valuable institution in a modern anonymous industrial society.

This virtue argument has an obverse side, namely, that where the sale of organs is permitted it is generally degrading. Thus, under pressures of poverty, individuals may decide to "cash in" one of their disposable organs. In India, the sale of organs is permitted and most of these organs are believed to end up in wealthier countries. The problem with selling life-saving organs is that they tend to be very expensive. This introduces what many see as an unacceptable element of unfairness because wealthy people can always afford to purchase organs but poor people cannot. Moreover, there is a strong economic motive for poor people to sell their organs but none for wealthy people to do so. The inevitable consequence of a free market in organs would be that they would be purchased by wealthy people and countries from poor individuals and nations. Many people reject the prospect of such unfairness in the practice of medicine.

In the United States, sale of organs was prohibited by the National Organ Transplantation Act of 1984. The very high costs of organ transplantation are borne mainly by medical insurance companies and are thus distributed in the form of increased health insurance premiums paid by businesses and individuals. These expensive operations add at least 4% (and potentially as much as 24%) to the national health care budget, which means that the small number of transplant recipients are draining over 700 times as much out of the system as the average individual. Whether this huge expense is merited by the benefits to organ recipients or ought to be spent elsewhere in the health care system merits careful analysis.

Given the pressing issue of organ scarcity, medical researchers have investigated alternatives, such as artificial hearts and organs from nonhuman animals. Neither of these approaches has worked well due to a variety of technical problems. It is possible that these difficulties will be overcome with time. For example, the development of better immunosuppressant drugs may allow for widespread use of animal organs. Animal rights activists object to the use of animal organs as speciesist, namely, unfairly elevating the interests of humans over other species, but medical researchers reject this view and physicians generally place a higher value on human than animal life.

In addition to artificial organs and animal grafts, there are at least two other technical approaches that could be important for increasing the supply of transplantable organs in the future. One is the development of genetically engineered animal strains whose organs produce less of an immunological reaction in human recipients. Another is the genetic engineering of isolated organs.
that can be designed for compatibility with different kinds of recipients. The perfection of such techniques would raise a whole range of new ethical problems. Thus, if it were possible to replace organs at will, life might be greatly extended raising the issue of when heroic medical interventions to prolong life should be ended.

**Selecting Recipients**

The scarcity of transplantable organs has not only raised the ethical question of how to increase the supply of organs but has also highlighted the issue of who should receive them. The decision as to who on a long waiting list should receive an available organ is difficult because nonselection usually means early death. Such decisions often rest on medical criteria predicting success of the transplant operation and are affected by other criteria of utility of the organ such as how long it is likely to be used for (which favors young and healthy recipients).

Transplants are thought of as an unusual privilege rather than a right. Some medical providers have qualms about giving a liver transplant to an alcoholic suffering from cirrhosis of the liver. There are two problems. One is that the liver has been destroyed as a result of an abusive lifestyle. The other is the fear that the transplanted organ will be destroyed by alcohol abuse. The introduction of such concerns about moral worthiness into the determination of who receives a medical treatment is seen by many ethicists as troubling and irrelevant. From the point of view of practical outcomes, former alcoholics are just as likely as others to survive liver transplantation and apparently have good records of abstinence following this gift of life.

Concern over inequities in recipient selection prompted the U.S. Department of Health and Human Services to issue guidelines promoting consistent medical criteria for organ allocation in 2000. The ruling calls for sharing of organs over wider geographical regions than previously practiced but not for a single national list. An independent advisory committee was formed to oversee organ allocation procedures in transplant operations.

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