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HUMAN ORGAN TRANSPLANTATION: SOME MEDICO-LEGAL PITFALLS FOR TRANSPLANT SURGEONS*

The path of the common law is strewn with the bones of men willing to take a chance.

—Attributed to Justice Oliver Wendell Holmes

Mr. Potter, an Englishman, received a skull fracture and extensive brain damage in a barroom brawl. He later stopped breathing and hospital physicians placed him on a mechanical respirator so that one of his kidneys could be removed for transplantation. After approximately twenty-four hours on the respirator, surgeons removed the kidney from his body. When the respirator was turned off, there were no spontaneous respirations, and Potter's heart soon stopped.¹

At the inquest the coroner testified that his consent to the kidney removal was based upon the supposition that it would occur after death. Nonetheless, the coroner felt that although Potter was alive when his kidney was removed, the doctors had committed no offense because there had been no hope of saving his life. One attending physician said he supposed the patient was medically dead one day (when he stopped breathing) and legally dead the next (when his heart stopped). A consulting neurological surgeon said Potter died before the kidney was removed. Moreover, the Home Office pathologist stated that brain damage was the cause of death and removal of the kidney was irrelevant.²

The Dean of the Faculty of Laws at Newcastle University commented that the removal of the organ was unlawful without the consent of Potter himself, since legally he was still alive when his kidney was removed and because the surgery was not performed for the patient's benefit. Additionally, the Dean was of the opinion that Potter's wife, who had given consent, was a party to the act and thus would be liable to the executors of her husband's estate in a civil action. The physicians who turned off the respirator were, in the Dean's view, guilty of homicide, which relieved the barroom assailant of responsibility for the death.³

This non-hypothetical case illustrates the serious medical-legal problems posed by variant medical and legal definitions of death. When Dr. Christiaan Barnard performed the first human heart transplant in December 1967,⁴ he dramatically introduced the lay public to the era of organ transplantation.⁵

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1. *Moment of Death*, 2 BRITISH MED. J. 394 (1963).

2. *Id.*

3. *Id.* The murder charge against the barroom assailant was reduced to common assault since the intervening acts of the physicians apparently mitigated the original charge.

4. Barnard, *A Human Cardiac Transplant: An Interim Report of a Successful Operation Performed at Groote Schuur Hospital, Cape Town*, 41 S. AFR. MED. J. 1271 (1967).

5. Modern medicine has made the cadaver of a complete stranger the most important
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The medical profession, however, had been aware of the feasibility of heart transplantation for years, and many surgeons had already transplanted less vital organs.⁶ Nonetheless, the Barnard feat did serve to focus worldwide attention⁷ on transplant surgery, along with its concomitant problems and potential benefits.⁸ The increased publicity accompanying recent transplants has heightened awareness of the serious legal problems illustrated by the Potter situation. It may fairly be assumed that, when the current glamour⁹ of transplantation surgery subsides, increased public awareness of such procedures will result in litigation in situations that previously went unnoticed by the courts. As litigation increases, the dichotomy of legal and medical viewpoints must be satisfactorily resolved if individuals are to be protected and the full utilization of organ transplantation procedures assured.

The confusion arose in Potter's case because the physicians considered the donor to be dead at a time when the law still considered him to be alive.¹⁰ Like the pathologist from the Home Office, most members of the medical profession presently advocate a definition of death based on the central nervous system (CNS).¹¹ In the law, however, the well-settled definition of death as "total stoppage of the circulation of the blood and a cessation of . . . respiration [and] pulsation"¹² persists. The medical profession has established that the CNS may be completely dead while other systems and

single factor in the life of a possible recipient. The old notion of the worthlessness of a dead body is today as far from reality as the concept that the heart of an individual must stop before he is dead.

6. Wasmuth & Stewart, *Medical and Legal Aspects of Human Organ Transplantation*, 14 CLEV.-MAR. L. REV. 442, 443-46 (1955).

7. A possible reason for the increased interest is the persistence of ancient attitudes that seem to regard the heart more as myth than muscle. It is reported that the widow of the donor of the second Barnard transplant said she could detect in the recipient certain personality traits of her deceased husband. Brewer, *Cardiac Transplantation*, 205 J.A.M.A. 691 (1968).

8. Each year 200,000 deaths of American men and women between the ages of 15 and 64 result from acquired heart disease. Of this number, 81,000 could benefit from transplantation. Annually 260,000 persons die who are theoretically capable of being heart donors. This means that approximately one out of three people in this age group who dies must be both available and fit to be a donor if the need for donor hearts is to be met. Cooper, *Summation: Symposium on Heart Transplantation*, 1 TRANSPLANTATION PROCEEDINGS 748 (1969).

9. A poll conducted in 1968 revealed that 70% of those polled said they would be willing to donate an organ after death. Schmeck, *The Public's Attitude Toward Clinical Transplantation*, 1 TRANSPLANTATION PROCEEDINGS 670 (1969).

10. Observations by surgeons that heart donors are clinically dead but legally alive indicate there is an awareness among practicing transplant surgeons that a disparity exists between their actions and what the law allows. Somerville, *Problems in Cardiac Transplantation from the Cardiologist's Viewpoint*, 12 PROGRESS IN CARDIOVASCULAR DISEASES 174 (1969).

11. See, e.g., *a Definition of Irreversible Coma, Report of the Ad Hoc Committee of the Harvard Medical School To Examine the Definition of Brain Death*, 205 J.A.M.A., 337, 339 (1968) [hereinafter cited as *Harvard Report*].

12. BLACK'S LAW DICTIONARY 488 (4th ed. 1951). BLACK's definition is utilized in most jurisdictions. See, e.g., *Smith v. Smith*, 229 Ark. 579, 586, 317 S.W.2d 275, 279 (1958).

organs live on for differing lengths of time.¹³ Since the brain is necessary for life as a meaningful individual, many physicians feel that a person is dead when his brain dies, regardless of the condition of the other organs.¹⁴ Thus, established legal definitions and developing medical definitions of death are obviously incompatible.¹⁵

The problem is of more than academic or technical importance.¹⁶ Transplant surgeons are in fact removing live, beating hearts from human donors.¹⁷ The heart, as well as other organs, is removed while still viable, after it is determined that the brain (CNS) is dead.¹⁸ If the heart is not needed for transplantation, it is simply allowed to stop after the artificial life support mechanisms are turned off.¹⁹

In view of prevailing medical knowledge and practice, the present variance between legal and medical positions on death determination places transplant surgeons in potentially serious legal jeopardy.²⁰ The deputy district attorney for the city of Los Angeles, for example, feels that transplant surgeons are committing murder because of the uncertain legality of the brain death criteria used by the physicians.²¹ Everyone is presumed to know the law as it pertains to his criminal actions. Thus, if legal death is cessation of heartbeat and respiration, the fact that a defendant thought another definition sufficed would not be a defense to a charge of homicide. If a person commits an act that is imminently dangerous to another, and this results in death, a Florida court has said a verdict of second degree

13. Shapiro, *Heart Grafting in Man*, 15 J. FORENSIC MED. 1, 3 (1968). Every medical student has seen a muscle removed from an animal's body contract when electrically stimulated. Also, reptilian hearts which have a low oxygen consumption rate (cold blooded), may be removed from the animal and observed to beat spontaneously and rhythmically for hours.

14. See *Symposium: Definition of Life: "When Do You Pull the Plug?"*, 205 J.A.M.A., July 1, 1968, at 29, and text accompanying note 66 *infra*.

15. Many physicians have shown a resistance to pressing for a change in the legal definition of death, feeling that a legal enactment would necessarily be rigid and restrictive. There is a sentiment that the danger of effective prosecution is remote because expert testimony not supporting the brain death criteria would be impossible to obtain. (From personal conversations with transplant physicians.)

16. See note 20 *infra*.

17. Cokkinos, *Human Cardiac Transplantation: Experience and Results with 21 Cases*, 62 J. NAT'L MED. ASS'N 8, 9 (1970).

18. Kahn, *et al.*, *Human Heart Transplantation for Cardiomyopathy*, 67 SURGERY 122, 123 (1970).

19. At the University of Florida Medical Center, for example, brain death criteria are used in determining death in potential transplant donors. See *Criteria for Death in the Case of Potential Donors of Organs*, June 11, 1970, which sets forth standards governing transplant activities at the Medical Center. No heart transplants have yet been performed, although there have been numerous kidney transplantations.

20. Bernard D. Hirsch, General Counsel for the A.M.A. has been quoted as saying: "[I]t is not only malpractice but, in cold terms, murder to remove a heart for transplant purposes as long as [the donor] is living. As long as the heart is beating spontaneously . . . I believe that the law would consider that person to be alive." Letter from Edwin J. Holman, Department of Medical Ethics, Office of the General Counsel, American Medical Ass'n, to Walter C. Ward, Feb. 12, 1970.

21. N. Y. Times, May 8, 1968, §5A at 23, col. 1.

murder is justified.²² Malice is not required,²³ and if a premeditated design with specific intent is absent, the proper charge is second degree murder.²⁴

One test used by the courts to determine whether a person is guilty of homicide is whether the action taken is a substantial contributing factor in the death of the individual.²⁵ It follows that more than one person may contribute to the homicide. If the heart was removed from a patient who had been bludgeoned nearly to death by an assailant, the remover would be a substantial contributor to the demise of the victim. Similarly, if a surgeon removed the heart of a patient who was suffering from a cerebral hemorrhage that would no doubt eventually kill him, the surgeon, nevertheless, would be inflicting a wound that materially promoted or hastened death. The surgeon's act could thus be said to have caused the death.²⁶ The death in either of the above examples could be considered the direct result of the actions of the surgeon since "[a] direct result is one which immediately and necessarily follows the act."²⁷ These situations exemplify an intervening, independent act and would result in the intervenor sharing in the guilt.

A commentator has recently stated:²⁸

[N]o Anglo-American legislature has yet . . . provide[d] a definition of death accordant with the new concepts. . . . The time may come with the philosopher, theologian, ethician and moralist will acknowledge, along with the natural scientist, the notion of cessation of human life when there is irreversible brain destruction, despite the continued vitality of even as significant an organ as the heart. . . . But that day has not yet come. Apparently it is still the law that the remover of a naturally beating heart (to be distinguished for this purpose from one that beats only because of artificial stimulus) is subject to the risk of committing homicide.

Although there are no appellate cases on the point, the civil counterpart of such an action would probably be for wrongful death.²⁹ It is apparent,

22. *Parrish v. State*, 97 So. 2d 356, 359 (1st D.C.A. Fla. 1957). First degree murder requires a premeditated design to kill. FLA. STAT. §782.04 (1) (1967).

23. FLA. STAT. §782.04 (2) (1967). The statute, however, requires a "depraved mind regardless of human life."

24. *Purkhiser v. State*, 210 So. 2d 448 (Fla. 1968).

25. *State v. Luster*, 178 S.C. 199, 208, 182 S.E. 427, 431 (1935).

26. *Talley v. State*, 174 Ala. 101, 105, 57 So. 445, 446 (1912).

27. *Frey v. State*, 97 Okla. Crim. 410, 413, 265 P.2d 502, 505 (1953).

28. *Louisell, The Procurement of Organs for Transplantation*, 64 NW. U. L. REV. 607, 623 (1969).

29. Recently, the brother of a deceased patient initiated a suit for \$1 million against the transplant team at the Medical College of Virginia alleging that his brother was prematurely pronounced dead so that his heart could be transplanted into another. The complaint charged that the defendants "embarked upon a systematic and nefarious scheme to excision [sic] [the] heart from his body and transplant it unto [sic] the body of another, and did in fact terminate the life . . . for that specified [sic] purpose." Further, plaintiff charged that defendants "willfully, wrongfully, wantonly and intentionally pronounced [him] dead ahead of his actual death, in violation of law . . ." Complaint at 6, *Tucker v. Lower, Law & Equity Ct., City of Richmond, Va.* (1970).

therefore, that surgeons assume considerable risk when they remove organs from individuals who, although considered dead by physicians after applying sophisticated technology, are legally alive.

THE PROBLEM OF CONSENT

Aside from difficulties posed by death determination, the need for legal consent before organs may be removed from a cadaver presents a variety of legal and ethical problems: Who can consent? Can a person make a testamentary disposition of his body? May consent be given by the next of kin (used here to include the spouse) before the death of an unconscious patient who is hopelessly ill? Is it lawful to refuse consent for organ removal and to bury a cadaver with a viable organ desperately needed by a critically ill patient? Is it moral? In an effort to clarify some of these problems of consent, Florida has become one of forty-one states to adopt the Uniform Anatomical Gift Act.³⁰

THE UNIFORM ANATOMICAL GIFT ACT

The Power of the Testator To Make a Gift

The Uniform Anatomical Gift Act abrogates the common law concept that a will or other instrument purporting to control the disposition of a decedent's body is legally invalid.³¹ Under the Act, anyone who is of sound mind and eighteen years old may execute a document disposing of his body or parts thereof³² in the interest of science³³ after his death.³⁴ Such a document takes precedence over the wishes of the next of kin.³⁵

30. FLA. STAT. §736.20 (1969). A detailed comparison of the Act as proposed by the National Conference of Commissioners on Uniform State Laws, and as adopted by the Florida Legislature, is beyond the scope of this note. Only those portions dealing directly with the legal implications of death determination and consent will be considered.

31. This concept originated at about A.D. 650, when fear of the dead impelled civil authorities to assign the chore of cadaver disposal to the church. The practice grew until the ecclesiastical courts had complete control of dead bodies; the secular courts took no interest in them. There could therefore be no property rights in the body since the law did not recognize the corpse as a valuable entity. *See, e.g.*, 2 W. BLACKSTONE, COMMENTARIES 429 (Tucker ed. 1969); 4 W. BLACKSTONE, COMMENTARIES 236 (Tucker ed. 1969). The only right was for the next of kin to obtain the corpse for burial purposes. *Williams v. Williams*, 20 Ch. D. 659, 664, 46 L.T.R. (n.s.) 275, 278 (1882).

32. FLA. STAT. §736.23 (1) (1969).

33. FLA. STAT. §736.24 (1969).

34. FLA. STAT. §§736.25 (1)-(2) (1969).

35. FLA. STAT. §736.23 (6) (1969). Specific reference is made to the new science of organ transplantation as being a motivation of the legislature in passing the Act. FLA. STAT. §736.21 (1969).

The Power of the Next of Kin To Make a Gift

If the deceased fails to leave a document expressing an intent to dispose of his body, and in the absence of knowledge that he objected to donation of his body, the next of kin may make the gift.³⁶ The Act also establishes a hierarchical order of next of kin who have authority to donate and provides that the objection of a person in the same or prior class may block the gift. Additionally, a spouse may not make a gift if any adult son or daughter objects.³⁷

Power To Make a Gift: The "Immediately" Problem

An important and problematical provision regarding the power to make a gift is that the next of kin may make a gift of the patient's body "immediately" before death.³⁸ The inevitable question is: How long is "immediately"? This provision seems to grant a type of property interest in a living person to the next of kin. Such a provision may be desirable despite its seeming repugnance to usual concepts of individual integrity. As a practical matter, relatives are usually not willing to be inconvenienced in order to authorize post mortem donations of organs for transplant. One purpose of this provision is apparently to allow a gift to be made at a time convenient to the next of kin. This avoids the risk of losing potential donor organs if death occurs at some awkward midnight hour when persons authorized to donate will likely refuse to come to the hospital and sign the requisite papers. If the statutory intent is to afford convenience to the donating kin, the term "immediately" probably means hours at least, because if merely a matter of minutes is involved, the convenience justification is lost: relatives will probably be willing to wait a few minutes until death can be pronounced before leaving the hospital. Whether the term "immediately" means hours or days must be resolved by the courts since the term is uninformative standing by itself.

The interpretation of the term "immediately" also relates to the medical desirability of obtaining consent to conduct tests and to remove organs at the earliest possible time. Before an organ may be accepted for donation, tissue typing and other testing must be carried out.³⁹ The Act seems to provide that an ante mortem gift by a donor himself may be construed to include consent to perform ante mortem tests in order to determine fitness of the organ for the intended transplantation.⁴⁰ In the absence of such

36. FLA. STAT. §736.23 (2) (1969).

37. *Id.*

38. FLA. STAT. §736.23 (4) (1969). "The persons authorized by subsection (2) may make the gift after death or immediately before death."

39. Rapaport & Dausset, *Immunological Principles of Donor Selection for Human Cardiac Transplantation*, 12 PROGRESS IN CARDIOVASCULAR DISEASES 119 (1969).

40. FLA. STAT. §736.23 (5) (1969). It should be remembered, however, that the terms of the Act provide that the gift takes effect only after death. As a result, it is questionable whether there is any statutory authorization for ante mortem testing in the Act.

consent, it is doubtful whether permission given by the next of kin to perform ante mortem testing is valid.

While under the Act an unconscious dying patient's next of kin may accomplish an ante mortem *gift of the donor's organs* to take effect after or "immediately before" death,⁴¹ the Act contains no specific authorization permitting third party consent to ante mortem *testing* for determination of fitness. If an emergency arises in which the life of the patient is endangered and a procedure is necessary for his benefit, consent could be given by the next of kin. In their absence, the physician may proceed without consent.⁴² The transplant donor, however, is a person deriving no benefit from ante mortem testing incident to transplantation. In fact, he may have much to lose. In most cases the requisite tests can be performed without harm to the critically ill patient, but it is not unreasonable to assume that in some cases such tests could tip the scales of life and death. While the Act authorizes "any examination necessary to assure medical acceptability of the gift,"⁴³ its preamble specifies that the purpose of the Act is to regulate only gifts made *after the death of a donor*.⁴⁴ Although it is possible, even in view of the preamble, to construe the Act to authorize third party consent for ante mortem testing, another provision makes such a construction unlikely. This provision, as previously discussed, specifically allows third party gifts of the body of the deceased "immediately before death."⁴⁵ It is reasonable to assume that, since the drafters found it necessary to state this authorization specifically and since no ante mortem authorization appears elsewhere in the Act, consent by the third parties to ante mortem testing is unauthorized. If the drafters intended to authorize such action they probably would have done so explicitly.

Regardless of whether the provisions permitting ante mortem gifts by third parties also allow consent to testing, the Act is problematical because it assumes there is a point in time "immediately" before death that can be discerned by physicians. In fact, the medical profession has only recently (and with great difficulty) reached substantial agreement concerning the determination of when death itself occurs.⁴⁶ Thus, any assumption that physicians can accurately determine when death will occur in the immediate future is highly questionable. Certainly such conjecture is subject to wide disparity of opinion not only among members of the medical community, but also in the courts.

Even in simple cases not involving third parties, ascertainment of the time of death is crucial to the applicability of the Uniform Act.⁴⁷ Thus,

41. FLA. STAT. §736.23 (4) (1969).

42. *Chambers v. Nottebaum*, 96 So. 2d 716, 718 (3d D.C.A. Fla. 1957).

43. FLA. STAT. §736.23 (5) (1969).

44. FLA. STAT. §736.21 (1969).

45. FLA. STAT. §736.23 (4) (1969).

46. See generally *Harvard Report*, note 11 *supra*.

47. Except for the provisions of §736.23 (4) concerning consent by next of kin immediately before death and the possible interpretation that §736.23 (5) authorizes ante mortem testing, the Act regulates gifts to be made *after* death. See FLA. STAT. §736.21 (1969).

to the extent that disagreement in the medical profession exists concerning death determination, corresponding difficulties will be experienced by the courts in applying the Act. Undoubtedly it is the physicians who must finally determine death and upon whom courts must ultimately rely for information regarding the nature of death. Conflict between medical and legal definitions of death may not only produce confusion in the courts but also stifle optimum advancement of medical science. The following discussion attempts to provide elementary information concerning medical death that is essential to a proper analysis of legal problems involving death determination.

MEDICAL DEATH: A CHANGING CONCEPT

Medical scientists have known for many years that the gross observation of respiration and heartbeat is not an accurate representation concerning the vitality of body organs.⁴⁸ It is known that various organs may continue to live even after irreversible cessation of circulation and respiration, which has traditionally been the criterion for determining death.⁴⁹ Historically, this awareness has had little practical significance, since traditional criteria were adequate to determine a state from which no patient ever recovered, that is, simple death. However, the development of complex life support systems⁵⁰ has made it possible to maintain a patient's respirations and heartbeat indefinitely,⁵¹ thus preserving the indicia that normally indicate life. Moreover, some patients who are dead according to traditional criteria may eventually recover with the aid of life support machinery.⁵² Finally, the de-

48. The basic knowledge is not new. The revolutionary French, in their passion for liberty, equality, and the guillotine systematically recorded the observations that while the body may be lacking a head, the organs live on for a while. When medical experts examined guillotined victims they noted that, if the examination was carried out within an hour, the skin flinched when cut, muscles contracted if stimulated, the heart began beating if touched, and the intestines exhibited peristaltic movement. Some observers reported obtaining responses to questions asked of severed heads. Borel, *Defining Death*, 39 *GENERAL PRACTICE* 171, 172-73 (1969).

49. See Shapiro, note 13 *supra*.

50. Basically these systems are machines that, when connected to the patient's respiratory system (usually through an opening made in the trachea in the neck) draw air into the lungs and thereby perform the mechanical act of breathing. If the heart is not beating spontaneously, artificial pacemakers, applying mild electric current, may be used externally (on the chest wall) or internally (in the chambers of the heart) to initiate the beat. A modification of this process allows complete bypass of the heart and lungs, with the functions of these organs being performed outside the body, thus allowing the heart to remain still for easier surgery. This is called "cardiopulmonary bypass."

51. "[T]here is an untapped source of potential heart donors in the Intensive Care Unit of almost every hospital. These are patients essentially dead from extensive cerebral trauma or brain tumors." Shumway, Angell & Wuerflein, *Progress in Transplantation of the Heart*, 5 *TRANSPLANTATION* 900, 903 (1967).

52. With increasing frequency, every person who has respiratory or heart failure, if he makes it to a well-equipped hospital within a reasonable time, will experience an attempted resuscitation. These efforts may well include electric shocks to start the heart, and they will assuredly include some sort of respiratory support. Often these procedures will tide the patient over a critical stage, after which his own organs, including the brain, will re-

velopment of organ transplantation procedures involving cadaver donors is necessarily predicated upon the fact that not all parts of the body die simultaneously.⁵³ It is now clinically obvious⁵⁴ that heartbeat and respiration no longer provide for all purposes a workable indication of whether the patient is alive or dead.

Cellular and Personal Death

Modern medical conceptions of death have made possible the science of human cadaver organ transplantation. The medical profession's solution to the problem of death determination cannot be fully understood without at least a cursory knowledge of certain basic medical principles.

Human life,⁵⁵ as it relates to the individual, is manifested in two ways. The most elemental manifestation — the life found in the cells, tissues, and organs of the body — is the first essential to human existence. Equally vital to any accurate conception of the living human being, however, is a viable, thinking, and reasoning brain. The brain must function in order to offer the second manifestation of life — life as a unique human individual. The relationship of the individual to all of the organs of his body exemplifies a circumstance in which the whole is greater than the sum of its parts.⁵⁶

Analogously, death also has two manifestations. Since the cell is the basic structural and functional unit of the body,⁵⁷ the survival of the individual or the organ is dependent upon the survival of the cell. Thus, the ultimate test of whether life (and hence death) exists in an organ is whether the cells of the organ are alive and functioning.⁵⁸

Oxygen and a blood supply to carry it are essential to cellular life. Moreover, research in cellular biology reveals that different types of cells and organs require oxygen in varying amounts to remain alive. Thus, some cells may survive oxygen deprivation for relatively long periods while others

sume normal function. However, if these efforts are carried to the extreme of medical capability in a patient whose brain is dead, the result will be a complex tissue culture of the human body. The possibilities of tissue culture have been dramatically illustrated in an experiment in which a portion of chick embryo heart was kept alive and healthy for more than 25 years; much longer than the expected lifespan of the donor. 7 *ENCYCLOPEDIA BRITANNICA* 112A (1961).

53. See Shapiro, note 13 *supra*.

54. The term "clinically," as used here, refers to observations made directly by the physician with only the basic instruments for examination, as distinguished from indirect examinations made as a result of tests of the patient performed by a laboratory.

55. When the term "life" or "living" is used without qualification, it may be taken to apply to life in humans or higher orders of animals, as distinguished from plant, protozoan, or other lower forms.

56. Anatomically, there is no such thing as a "mind," yet it exists. The mind and its functions are the extra part of the equation.

57. 6 *ENCYCLOPEDIA AMERICANA* 134 (1969).

58. See Gordon, *The Biological Definition of Death*, 15 J. FOR. MED. 5 (1958). The electrocardiograph and the electroencephalograph are two instruments commonly used to test cellular viability by measuring electrical activity of the cells of the heart and brain, respectively.

die almost immediately. Kidney cells, for example, remain alive without oxygen for as long as an hour,⁵⁹ while heart cells begin to die within twenty to thirty minutes.⁶⁰ Brain cells are the most sensitive of all to oxygen deprivation: brain anoxia for as little as five minutes will cause irreversible damage.⁶¹ This schedule of cellular death makes it medically possible to salvage viable organs from cadavers whose brain cells are dead. A necessary concomitant of such operations is the ability to ascertain when cellular death of the brain has occurred, while other, less oxygen-sensitive organs remain viable.⁶²

Assuming that cellular death of the human body occurs in stages, with brain death normally occurring first, and further assuming that medical personnel can detect these events, transplant physicians are confronted with deciding at which stage of cellular death the patient as a human being may be considered dead. The problem extends not only to medical practice and ethics, but also to common morality and legal liability.⁶³

The currently prevailing medical view is that *personal* death, that is, death of the reasoning, thinking human being with individuality and uniqueness, occurs when the cells of the brain (or more accurately, the central nervous system or CNS)⁶⁴ are dead.⁶⁵

The fact that cellular CNS death is synonymous with death of the person is perhaps best stated by answering the question: What remains of a meaningful nature when the CNS has died? One panelist in a recent American Medical Association (AMA) symposium answered that "[l]ife ends with the death of the brain, no matter what the state of the other body functions." Another asserted that "[a] dead brain is a dead person; the body is still alive."

59. Nakamoto, Straffon & Kolff, *Three Years' Clinical Experience with Cadaver Kidney Transplantation*, 5 *TRANSPLANTATION* 854, 855 (1967).

60. Childs & Lower, *Preservation of the Heart*, 12 *PROGRESS IN CARDIOVASCULAR DISEASES* 149, 157 (1969).

61. See generally W. EVANS, *THE CHEMISTRY OF DEATH* (1963). Some brain cells have been found to survive for as long as 15 minutes without oxygen, but the brain is irreparably damaged.

62. Silverman, Saunders, Schwab & Masland, *Cerebral Death and the Electroencephalogram*, 209 *J.A.M.A.* 1505, 1506 (1968).

63. For a comprehensive and wide-ranging, though inconclusive, discussion of these problems by a group of well-qualified authorities see *CIBA FOUNDATION SYMPOSIUM: ETHICS IN MEDICAL PROGRESS* (1966).

64. Hereinafter, the terms "brain death" and "central nervous system death" may be used interchangeably. When used without qualification, it is intended that they be synonymous.

65. At least among physicians and scientists who have had to think the matter through, there seems to be acceptance of this concept. A real problem in death determination is the element of certainty. No responsible physician would advocate the continued artificial maintenance of a person if he could be sure the brain was dead. There are two areas of uneasiness: (1) legal; and (2) are we able to be *sure* that the person is dead using any criteria other than cessation of heartbeat and respiration? Many still have feelings of uneasiness when faced with the question: "Would you bury a man whose heart is still beating but whose brain is dead?" (Conclusion reached from personal conversations with physicians.) It is an emotionally charged but irrelevant query. In order to accomplish such a feat one would need careful planning. It would be necessary to continue respirator support to the graveside, then shovel rapidly.

A third perceptively recognized, however, that "the patient who has degenerated to a medical 'nonperson' is still symbolically a person to somebody."⁶⁶

The third remark reaches the basic difficulty involved in gaining public and thus legal acceptance of a new definition of death. When the CNS has died but the rest of the body remains alive, an emotion-laden symbol of life remains, even though, from the standpoint of meaningful existence, death may have already occurred. The crucial question is whether, in the balancing process, the importance of the symbol should prevail over the opportunity to save the life of another person through medical organ transplantation. A subsidiary, but equally important problem involves the ability of the medical profession to determine with absolute certainty the time of CNS death. If medical considerations are to prevail and CNS death is to be treated as the death of the person,⁶⁷ it is essential that the medical profession be able to determine with accuracy and complete certainty when the brain is irretrievably dead but other body organs remain living.

The Medical Controversy: What and When Is Death?

Even before the first human cardiac transplant, controversy concerning death determination in the context of organ transplantation had arisen. At the Ciba Foundation Symposium⁶⁸ in 1966, the discussion of death determination for kidney transplant purposes evinced wide disagreement. One physician stated that he doubted whether any member of his transplant team could accept a person as being dead so long as there was a heartbeat.⁶⁹ He noted, however, that at some medical centers kidneys had been removed for transplantation from patients whose hearts were still beating.⁷⁰ Other doctors felt no such scruples, but did recognize an urgent need for the law to catch up with the state of medical knowledge relating to death determination.⁷¹ These physicians, however, disagreed concerning precisely which medical criteria should be used to determine death.⁷² Despite a general lack of unanimity otherwise, all participants seemed to agree that the matter of death determination as it related to medical organ transplantation presented important legal issues and that resolution of the problem within the medical profession was a prerequisite to the development of a satisfactory legal definition of death.⁷³ The cause of disagreement among the panelists at the Ciba

66. *Symposium: Definition of Life: "When Do You Pull the Plug?"*, 205 J.A.M.A., July 1, 1968, at 29.

67. The hospital is the only practical place to use the EEG criteria of death; the transplantation setting is the most rewarding use. However, practically every death is a brain death and it matters not that no EEG is taken in a vast majority of cases. Death will still usually be pronounced by directly observing the patient for absence of respiration and circulation.

68. *See CIBA FOUNDATION SYMPOSIUM: ETHICS IN MEDICAL PROGRESS* (1966).

69. *Id.* at 70.

70. *Id.* at 67.

71. *Id.* at 68.

72. *Id.* at 73.

73. *Id.* at 65-77.

Symposium has become an even more urgent problem with the advent of cardiac transplantation.

Proposed Resolution of the Controversy: The Harvard Report

In an effort to provide guidelines in formulating medical standards concerning cadaver organ donors, a special committee was established at the Harvard Medical School. The final report⁷⁴ of this committee, issued in August 1968, emphasized that "irreversible coma has many causes, but *we are concerned here only with those comatose individuals who have no discernible central nervous system activity.*"⁷⁵ The report of the committee and subsequent comment by other authorities⁷⁶ have stated that there are three important prerequisites to accurate evaluation by the means suggested. There must be: (1) no overdose of sedative drugs, (2) no hypothermia, and (3) no encephalitis.⁷⁷ When these causes of coma are removed, the following criteria are said to represent brain death:⁷⁸

- (1) unreceptivity and unresponsivity — a total unawareness of externally applied stimuli and inner need;
- (2) no movements or breathing after observation for one hour by a physician, and a three-minute interval of no spontaneous respiration with the respirator turned off;
- (3) no reflexes — the pupils dilated and fixed in that position even when exposed to light, and all other reflexes absent;
- (4) a flat electroencephalogram (EEG) properly taken;
- (5) all of the above when repeated twenty-four hours later with no change.

The report made no mention of heartbeat — one traditional legal criterion of death determination. Although apparently still obscure to some physicians because of subsequent misquoting,⁷⁹ the conclusions of the Harvard

74. *A Definition of Irreversible Coma, Report of the Ad Hoc Committee of the Harvard Medical School To Examine the Definition of Brain Death*, 205 J.A.M.A. 337 (1968) [hereinafter cited as *Harvard Report*].

75. *Id.*

76. See, e.g., Korein & Maccario, *On the Diagnosis of Cerebral Death — A Prospective Study*, 27 ELECTROENCEPHALOGRAPHY & CLINICAL NEUROPHYSIOLOGY 700 (1969); Nimmanitya & Walker, *Significance of the Electroencephalograph in Comatose Respiratory Cases*, 1969 CURRENT MED. DIG. 189; Silverman, Saunders, Schwab & Masland, *Cerebral Death and the Electroencephalogram*, 209 J.A.M.A. 1505 (1968).

77. Bental & Liebowitz, *Flat Electroencephalogram During 28 Days in a Case of "Encephalitis,"* 13 ELECTROENCEPHALOGRAPHY & CLINICAL NEUROPHYSIOLOGY 457 (1961). Any infectious disease in a potential donor makes him unsuitable. This is also true of malignancies other than primary brain tumors, which rarely spread outside the brain. Cases have been reported where cancer developed in the transplanted organ. See, e.g., Leatherman, et al., *Medical Management of Cardiac Transplant Patients*, 46 POSTGRADUATE MED. 76, 77 (1969).

78. *Harvard Report*, supra note 74, at 337-38.

79. See, e.g., Brewer, *Cardiac Transplantations: An Appraisal*, 205 J.A.M.A. 691 (1968), where the author states: "A simple definition of death should include irreversible loss of <https://scholarship.law.ufl.edu/flr/vol23/iss1/7>

Report did offer basic guidelines that have become widely followed.⁸⁰ Even at the relatively recent date of its issue, however, the report did not represent the consensus of the medical profession.⁸¹

A meeting of surgeons and others concerned with heart transplantation was held in Capetown, South Africa, at approximately the same time as the meetings of the Harvard committee.⁸² Dr. Denton R. Cooley reported that the "sticky question" of how to determine donor death was discussed, but there was no heated controversy — probably because "all of us had answered this question for ourselves a long time ago."⁸³ However, another reporter at the Capetown meeting maintained that there was "considerable debate over the removal of a heart still beating." He also maintained that the conclusion of the members at the meeting was that the traditional criteria of total cessation of heartbeat and respiration must remain the unalterable criteria for death determination.⁸⁴ Apparently, all agreed that brain death should be required, but that, in addition, there should be respiratory and circulatory failure.⁸⁵ It is significant that the term "circulatory failure" is used instead of cessation of heartbeat, since the circulation begins to fail when the blood pressure cannot be naturally maintained. This does not necessarily require cessation of heartbeat.⁸⁶

cerebral function with cessation of breathing and heart beat. See, for example, the definition of irreversible coma by the Harvard ad hoc committee."

80. See note 76 *supra*.

81. Recently, the only substantial disagreement has been in the length of time the EEG must be flat before CNS death may with certainty be pronounced. See text accompanying notes 104-108 *infra*.

82. Cooley, *Minutes of the Capetown Meeting*, 9 MED. WORLD NEWS, Aug. 9, 1968, at 21.

83. *Id.*

84. Shapiro, *New Hearts for Old?*, 16 J. FOR. MED. 117 (1969).

85. Dr. Cooley followed the practice of waiting for circulatory failure in his early transplants. See, e.g., Cooley, *et al.*, *Clinical Experience in Transplantation of the Human Heart: Report of Ten Cases*, 1 TRANSPLANTATION PROCEEDINGS 703 (1969). The first in this series of ten cases took place after Barnard's second transplant. Dr. Cooley reports: "When death was inevitable . . . Cerebral death had already occurred . . . When circulation and cardiac action failed . . ." the operation was performed. In another report, Dr. Cooley states: "In each instance the donor was moved to the operating room many hours after cerebral death occurred. Cardiac activity still persisted assisted by mechanical pulmonary ventilation and by vasopressors and other infusions. When circulation and cardiac action finally failed . . ." the operation was performed. Cooley, *et al.*, *Transplantation of the Human Heart*, 205 J.A.M.A. 479, 480 (1968). This leaves some doubt concerning whether the heart was allowed to stop completely or whether the blood pressure was merely falling.

86. Cokkinos, *Human Cardiac Transplantation: Experience and Results with 21 Cases*, 62 J. NAT'L MED. ASS'N 8, 9 (1970). In this impressive series, the usual EEG and neurologic criteria, plus a *failing* circulation, were used. The distinction between a stopped and a failing circulation is very important. Failing circulation is indicative of the failing of the last reserves of the body, since the blood pressure is governed by a complex interplay of nerves, hormones, and muscles. When circulation begins to fail and brain death is already determined, there is nothing further to be done for the patient. On the other hand, if the heart has already stopped on account of anoxia, it has been damaged. Additionally, the wait until complete cessation of heart beat may upset the balance of cellular enzymes and minerals with resulting damage of so subtle a nature that it is not recognized. The

Regardless of the Capetown meeting and misunderstandings regarding the Harvard report,⁸⁷ the practices of the transplant surgeons have evolved toward the use of the CNS criteria as the arbiter of death. This was due in part to the exhaustive documentation by electroencephalographers, who take and interpret electroencephalograms (EEG's).

The Role of the Electroencephalogram (EEG) in Death Determination

Physicians generally agree that when a person who is unsupported by artificial systems has no spontaneous heartbeat or respiration for an appropriate time, death has come. Most physicians would also now support the proposition that, when the brain has experienced cellular death, the person is dead. This inevitably poses the problem of how to determine with absolute certainty that the brain is dead.

In 1964 at the annual meeting of the AMA, Dr. Hannibal Hamlin of the Harvard Medical School urged physicians to utilize the EEG as an aid in death determination. He stated that this device, coupled with clinical evaluation of the patient's nervous system, could give strong confirmatory evidence that brain activity had ceased, which in his view constituted death.⁸⁸

Actually, clinical observation of the CNS has for many years been a factor in medical death determination. The cessation of spontaneous respiration and a lack of reflexes, for example, are signs of neurological death that are routinely taken into account in the physician's evaluation.⁸⁹ The EEG provides an additional means of evaluating the CNS, which may reveal more detailed information than clinical observation performed without the aid of such devices.

Controversy has been slow to disappear among members of the medical profession concerning the accuracy and reliability of the EEG as an indicator of CNS death. Moreover, the EEG has not been uniformly utilized in death determination prior to organ removal for transplant surgery. Unlike later transplant teams, the physicians who performed the first human heart

recipient, therefore, gets an inferior organ if there is needless waiting. This is true whether the organ be heart or kidney.

87. Appel, *Ethical and Legal Questions Posed by Recent Advances in Medicine*, 205 J.A.M.A. 513 (1968). This author erroneously listed criteria that had been widely accepted: (1) complete absence of reflexes and reaction to stimuli; (2) no breathing after 5 minutes off the respirator; (3) falling blood pressure; (4) flat EEG (also said it was essential that spontaneous circulation should have ceased). *Id.* at 514. This was either carelessness or lack of understanding of the very criteria that he listed. A similar error is made by Perper, of the Department of Forensic Medicine of Johns Hopkins University: Perper, *Ethical, Religious, and Legal Considerations to the Transplantation of Human Organs*, 15 J. FOR. SCI. 1, 18 (1970). He also erroneously states that the new criteria include absence of spontaneous circulation. See also Brewer, note 79 *supra*.

88. Ayd, *When Is a Person Dead?*, 4 LAWYER'S MED. J. 81, 87 (1968).

89. Muller, *Legal Medicine and the Delimitation of Death*, 14 WORLD MED. J. 140 (1967). For some skeptics, the CNS observations were not sufficient. They preferred to wait for cooling of the body, rigor mortis, and the first signs of putrefaction (a green spot appearing on the abdomen, and the odor of hydrogen sulfide at the nostrils).

transplant, for example, apparently did not utilize an EEG, although neurological death was established by clinical observation of respiration and reflexes.⁹⁰ In part, the lack of acceptance is attributable to difficulties that resulted when researchers evaluating the reliability of the EEG failed to account for certain special factors⁹¹ in individual cases.⁹² Available research has shown, however, that the EEG is an extremely accurate indicator of death when used properly and when the above mentioned extraordinary factors are accounted for.⁹³

A report compiled by an ad hoc committee of the American Encephalographic Society indicates that the EEG may indicate death with impressive accuracy.⁹⁴ The study involved 1,665 patients with flat (isoelectric) EEG's, indicating a cessation of electrical activity in the CNS. Of this number, the only three who eventually survived were patients who had attempted suicide by taking overdoses of barbiturates and meprobamate.⁹⁵ It will be recalled that these three would have been excluded as potential cadaver donors under the criteria of the Harvard report.⁹⁶ Of those who met the Harvard criteria, not one patient survived. Nonetheless, the EEG study committee agreed that the results of the EEG alone should not be the sole criterion for establishing CNS death.⁹⁷

A study conducted at Johns Hopkins University resulted in similar conclusions.⁹⁸ EEG's were performed to aid in determining the death of forty-one comatose patients,⁹⁹ all of whom were supported at the time by respirators.¹⁰⁰ Of this number, two-thirds had a completely flat EEG record; the other third showed some electrical activity, indicating that the brain was in some part alive.¹⁰¹ All patients eventually experienced heart stoppage.¹⁰² The doctors concluded that a flat EEG probably indicates a dead brain and a dead person.¹⁰³

90. Barnard, *A Human Cardiac Transplant: An Interim Report of a Successful Operation Performed at Groote Schuur Hospital, Capetown*, 41 S. AFR. MED. J. 1271 (1967).

91. See, e.g., Sament & Huott *The EEG in Acute Barbituate Intoxication, with Particular Reference to Isoelectric EEG's*, 27 ELECTROENCEPHALOGRAPHY AND CLINICAL NEUROPHYSIOLOGY 695 (1969). Acute drug intoxication is important in this context because it can cause a flat EEG. Often these patients recover; therefore they should not be used as donors. However, in this series of 26 cases, all 6 who had flat EEG's because of drugs died from various complications (not cerebral).

92. *Harvard Report*, *supra* note 74, at 338. Failure to note the exclusions mentioned could result in a failure of confidence in the EEG as an adjunct in death determination.

93. See authorities cited note 76 *supra*.

94. Silverman, Saunders, Schwab & Masland, *Cerebral Death and the Electroencephalogram*, 209 J.A.M.A. 1505 (1968).

95. *Id.*

96. *Harvard Report*, *supra* note 74, at 338.

97. Silverman, *supra* note 94, at 1509.

98. Nimmannitya & Walker, *Significance of the Electroencephalogram in Comatose Respirator Cases*, 1969 CURRENT MED. DIG. 189, 200.

99. *Id.* at 189.

100. *Id.*

101. *Id.* at 197.

102. *Id.* at 199.

103. *Id.* at 200.

Apparently, the only significant medical controversy that remains involves the duration of the period one must wait after the EEG is found to be flat before death is pronounced. The Harvard report advised a twenty-four hour wait.¹⁰⁴ The American Encephalographic Society committee advised that a wait of two hours is sufficient,¹⁰⁵ while the Johns Hopkins study simply said that a flat EEG probably means death.¹⁰⁶ The director of Electrophysiology at the Texas Medical Center, Houston, recently was quoted as saying that a flat EEG that remains flat for one hour is indicative of brain death.¹⁰⁷ There is an apparent tendency for more recent studies to conclude that shorter waiting periods are adequate. Future studies will probably indicate that an interval as short as thirty minutes is sufficient.¹⁰⁸

Coupled with other clinical observations, the EEG device apparently provides a sufficiently accurate and reliable indicator of CNS death to justify adopting CNS death as the proper medical criterion for determining the death of cadaver organ donors. Under the current state of medical science, the EEG thus provides the key to adopting a more realistic legal definition of death for organ transplant purposes.¹⁰⁹

Medical Controversy: What the Transplant Physicians Do in Practice

There is little doubt that Dr. Cooley is correct that the medical community has already decided the basic issues involving death definition for themselves.¹¹⁰ Activities of transplant teams have indicated that these physicians are confident that brain death answers every medical need and are using it even though it is not an adequate legal criterion.

In his more recent transplant operations, Dr. Cooley has not waited for the cessation of heartbeat before declaring the donor dead and therefore eligible as a donor.¹¹¹ In a discussion of general problems encountered in transplantation, he characterized the circulatory system as "failing" with blood pressure supported by medication.¹¹² This opinion is concurred in by Doctors Lower and Shumway, who developed the surgical technique of heart transplantation that is used worldwide.¹¹³ In response to the direct question: "Under what circumstances would a beating, viable heart be electively removed?" Dr. Cooley replied: "I think the procedure is permissible

104. *Harvard Report*, *supra* note 74, at 338.

105. Silverman, *supra* note 76, at 1507.

106. Nimmannitya & Walker, *supra* note 98, at 200.

107. Bowen, *Administrator Cites Questions that Must Be Resolved Before Transplantation Can Be Accepted as Practical Therapy*, 43 HOSPITALS 51, 52 (1969).

108. *Id.*

109. Organ donation is not the only situation in which the EEG is useful in death determination. A major use is to aid in determining when *any* critically ill patient, who is on a respirator, may be taken off. Probably respiration should not be discontinued if a spontaneous heartbeat is present without EEG confirmation of death.

110. Cooley, note 82 *supra*.

111. Cooley, *et al.*, *Transplantation of the Human Heart*, 205 J.A.M.A. 479, 480 (1968).

112. *Symposium*, 1 TRANSPLANTATION PROCEEDINGS 751 (1969).

113. *Id.* at 752.

with the diagnosis of brain death, especially in the presence of a rapidly failing circulation."¹¹⁴

Mr. Ted Bowen, Administrator of the Texas Medical Center where Dr. Michael DeBakey operates, states that physicians at the center used brain death criteria from the beginning of their transplant program.¹¹⁵ Mr. Bowen felt that undue delay in death determination involved critical, ethical problems because of the possibility of transplanting a bad organ into the recipient.¹¹⁶

A report from the University of Michigan Medical Center also revealed that brain death criteria have been used in three heart transplant operations at the center.¹¹⁷ Beecher, in a sequel to the original Harvard report, states that when the brain is dead, transplant physicians should not wait until the heart has stopped because this causes resulting damage to the vital organs needed in transplant. In his view, this benefits no one. He feels the course is clear, but doubts whether the medical community has the emotional and sociological maturity to handle the situation boldly.¹¹⁸ As a practical matter, however, transplant surgeons are utilizing brain death criteria whether or not they are facing up to the moral and legal issues.

LEGAL DETERMINATION OF THE TIME OF DEATH

No Definition of Death in the Uniform Anatomical Gift Act

All the terms of the Uniform Anatomical Gift Act¹¹⁹ are dependent upon one central event: the death of the donor.¹²⁰ In view of the crucial importance of this event, it is puzzling that the Act pays so little attention to it. This omission is the most crippling aspect of the Act. Subsection 736.28 (2) provides that the time of death shall be determined by the physician who attends the donor at death or who certifies death.¹²¹ This brief statement does nothing to establish or define the criteria to be used in determining the time of death.¹²²

114. *Id.* at 751.

115. Bowen, note 107 *supra*.

116. *Id.*

117. Kahn, *et al.*, *Human Heart Transplantation for Cardiomyopathy*, 67 SURGERY 122, 123 (1969). All of these donors had flat EEG's for 24 hours before transplantation. It was necessary to maintain the blood pressure with drugs, a potentially dangerous practice. If the 24-hour wait had not been followed, the heart would doubtless have been in even better condition.

118. Beecher, *After the "Definition of Irreversible Coma,"* 281 NEW ENG. J. MED. 1070, 1071 (1969).

119. FLA. STAT. §736.20 (1969).

120. FLA. STAT. §736.21 (1969).

121. "The time of death shall be determined by a physician who attends the donor at his death, or, if none, the physician who certifies the death. This physician shall not participate in the procedures for removing or transplanting a part." FLA. STAT. §736.28 (2) (1969). In an effort to avoid a rigid statutory straitjacket, the framers have wisely refrained from codifying a definition of death.

122. That there is need in this area for some legislative action seems to be generally
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The Time of Death as a Medical and Legal Responsibility

Superficially, it would seem that according to subsection 736.28 (2) death is what and when the attending physician says it is.¹²³ No one seriously questions that only physicians should have the final say in determining the fact and time of death.¹²⁴ It is significant, however, that when physicians make these determinations, they are made for medical rather than legal objectives. Nonetheless, it is obvious that the determination of what constitutes life or death has serious implications reaching into the fields of religion,¹²⁵ philosophy, ethics, and law.¹²⁶ The precise view of the death event will necessarily vary somewhat, depending upon the context in which it is considered.¹²⁷

recognized. Ayd, *supra* note 88, at 81, speaks of the need of the medical profession, families, patients, and society in general for guidelines in the area of transplantation. Since law is a reflection of the "moral consensus of society, it is mandatory that a new legal definition of death be framed." Beecher, *supra* note 118, at 1071, speaks of a need for medicine to acquire enough "emotional and sociologic maturity" to handle the question boldly. In a burst of what may prove to be over-optimism, Dr. Cooley, using the past tense, said "the medical and legal professions finally established a conclusive definition." Cooley, *Cardiac Transplantation in Man: Its Therapeutic and Other Importance*, 36 J. MT. SINAI HOSP. N.Y. 475, 482 (1969). It is pertinent to ask at this juncture: Where is the evidence that the "legal profession" has so acted? In order for any such change to be meaningful, it must involve court decisions or legislative action. There is none of either. Perper, *Religious, and Legal Considerations to the Transplantation of Human Organs*, 15 J. FOR. SCI. 1 (1970) concludes that the Uniform Act "does not give any definition of death and thereby exposes the physicians to possible criminal charges . . ."

123. In a symposium on the subject of renal transplantation, Mr. John R. Dixon, Chairman of the American Bar Association Committee on medico-legal problems, said that death should be when the physician says it is. He concurred with the commissioners of the Uniform Act in thinking that "no reasonable statutory definition is possible." It is, of course, true that there are no statutory definitions of death. It is not true that there is no legal definition. *Symposium*, 48 AM. J. MED., 93, 99 (1970).

124. Shillito, *The Organ Donor's Doctor: A New Role for the Neurosurgeon*, 281 NEW ENG. J. MED. 1071, 1072 (1969). This sensitive article details the conflicts that must be settled by the donor's doctor as they relate to the family and the donor. Since the mere determination of death is becoming more difficult and technical, it is essential that this determination not be restricted in any way. A flat EEG is not to be required in all deaths, and the causes of the coma are to be considered. The physician is the only person qualified by training and experience to make this judgment. *See also* Beecher, note 118 *supra*.

125. *See, e.g.*, Carroll, *The Ethics of Transplantation*, 56 A.B.A.J. 137, 140 (1970). This article represents the type of thinking that has succeeded in obscuring calm, rational consideration of vital issues through the ages. The arguments presented are ill-taken and emotionally based, without any discernible effort to reach the merits.

126. *See, e.g.*, Louisell, *Transplantation: Existing Legal Constraints*, in CIBA FOUNDATION SYMPOSIUM: ETHICS IN MEDICAL PROGRESS 78, 94 (1966). "The problem of the redefinition of the moment of death, in the light of current medical realities . . . requires the collaborative and precise thinking of physicians, lawyers, theologians, and philosophers."

127. Whether a person is dead may, in certain circumstances, be adequately determined by laymen because the usual criteria are so well-known. That the heart has stopped and that this constitutes death is assumed to be a part of the general knowledge of mankind, such as knowing that fire burns, water is wet, objects fall downward, and whether a person

In legal practice, the problem of determining the occurrence and time of death is usually a question of fact for the jury,¹²⁸ who rely on expert medical testimony. However, the court may accept or reject the standard used by physicians in determining death. *In re Schmidt*¹²⁹ is such a case: a husband and wife were involved in an automobile accident that was fatal to both. A coroner's report of the autopsy and the death certificates listed the deaths as simultaneous. In a previous decree, the wife had been found to have survived the husband by a few minutes. In a hearing to contest that finding, it was established that the husband had suffered a ruptured heart and other damage of such a nature that he would not have survived more than a minute or two. Witnesses at the scene observed that he made no sounds nor did he move nor have any reaction when light was shone in his eyes. The wife was seen to move her head, gasp for breath, and make moaning sounds. She was bleeding profusely from both ears and a pulse was present. All expert witnesses agreed that if the criteria of cardiorespiratory death were followed the observations concerning the wife could have meant that she had lived for at least as long as the sounds and breathing occurred.¹³⁰

However, counsel for the husband's estate maintained that the criterion for death determination should be brain death, or irreversible coma, and that the trial court erred in not using this criterion.¹³¹ This contention was rejected by the appellate court:¹³²

In the opinion of the medical experts death might be the inability to resuscitate or an irreversible coma. However, for purposes of this decision this Court considers death as defined in *Black's Dictionary* . . . "total stoppage of the circulation of the blood and cessation of . . . respiration and pulsation."

Appellants argue that the above definition is an anachronism in view of the recent medical developments relating to heart transplants. They contend that the trial court should have accepted and used . . . [the] . . . definition of death as the inability to resuscitate.

Schmidt is apparently the only case where heart transplantation is specifically mentioned and in which the recent medical changes in the definition of death are specifically recognized and rejected. *Smith v. Smith*,¹³³ however, similarly rejects any definition of death that does not conform to the definition set forth in *Black's Law Dictionary*. In *Smith* a man was killed instantly in an automobile accident. His wife remained unconscious

appears drunk. See, e.g., *In re Herrmann*, 75 Misc. 599, 136 N. Y. S. 944 (Sur. Ct. 1912), *aff'd* per curiam, *In re Laffargue*, 155 App. Div. 923, 140 N.Y.S. 743 (1st Dep't 1913), where the court said such an observation was a matter of fact and not mere opinion.

128. *Melbourne Airways v. Thompson*, 190 So. 2d 305, 306 (Fla. 1966); *John v. Burns*, 67 So. 2d 765, 767 (Fla. 1953).

129. 261 Cal. App. 2d 262, 67 Cal. Rptr. 847 (1968).

130. *Id.* at 272, 67 Cal. Rptr. at 853.

131. *Id.* at 272-73, 67 Cal. Rptr. at 854.

132. *Id.* at 273, 67 Cal. Rptr. at 854.

133. 229 Ark. 579, 317 S.W.2d 275 (1958).

for seventeen days, at which time her heartbeat and respiration ceased. In a testamentary dispute it was argued that, since the husband and wife both lost the ability to make testamentary dispositions at the same time, their deaths should be considered simultaneous. After quoting *Black's Dictionary*, the court commented:¹³⁴

[A]s a matter of fact, it would be too much of a strain on credulity for us to believe any evidence offered to the effect that Mrs. Smith was dead, scientifically or otherwise, unless the conditions set out in the definition existed.

This contention¹³⁵ is also consistent with *Thomas v. Anderson*,¹³⁶ in which the court considered death as occurring at the precise moment when the heart stops beating and respirations cease.¹³⁷

Previously, the use by courts of the traditional criteria in death determination has posed few problems. There has been no pressing need for any change in the legal definition of death. However, appellate courts have not yet considered this problem in any context other than the question of simultaneous death of testators.¹³⁸ No legislative enactment attempts to define death; and until the advent of organ transplantation using cadaver donors, there was no foreseeable need for a more precise legal definition. The advent of medical organ transplantation, especially cardiac transplantation, has created such a need.

WHY THE NEED FOR DEATH DETERMINATION WITHOUT DELAY?

Organ donors are in short supply. Studies have revealed that almost as many people die while waiting for transplants as die in the first month or

134. *Id.* at 586-87, 317 S.W.2d at 279.

135. Both *Schmidt* and *Smith* illustrate part of the need for a tightening of the references surrounding death. In both cases the resourceful attorney used the idea of irreversible coma, indicated by a failure to regain consciousness, as evidence of death. This is not the test of death in cases of irreversible coma. It is the flat EEG in the presence of numerous other factors, including lack of reflexes and breathing, which proves death. Failure to regain consciousness has no "relation back" application and, theoretically, the absence of consciousness does not bear on the definition of death. A person with an EEG tracing that indicates a live brain would not be dead even though he never regained consciousness. Such a state of affairs is possible and not rare.

136. 96 Cal. App. 2d 371, 215 P.2d 478 (1950), *rehearing denied*, 201 P.2d 816 (1950).

137. *Id.* at 376, 215 P.2d at 481-82. "Death is not a continuing event and is an event that takes place at a precise time." *Id.*

138. *In re Di Bella's Estate*, 199 Misc. 847, 100 N.Y.S.2d 763 (Sur. Ct. 1950), *aff'd*, 279 App. Div. 689, 107 N.Y.S.2d 929 (3d Dep't 1951). The court stated that one second of additional life, if established, was sufficient to determine survivorship under the Simultaneous Death Act. This could present a problem where husband and wife are injured at the same time, placed on respirators at the same time, and each has his respirator turned off in succession, with no spontaneous respirations occurring. Could survivorship be based on the fortuitous event of whose respirator was turned off last?

two afterward.¹³⁹ Moreover, the following technical medical considerations compel prompt identification of the death event in transplant situations:

(1) *Anoxia*.¹⁴⁰ Organs destined for transplantation from cadaver donors are more dependent for initial survival upon the duration of anoxia than upon any other single factor.¹⁴¹ One of the most common causes of transplant organ anoxia is the delay in removal after death.¹⁴² Excessive anoxia will render an organ unfit for transplantation; any anoxia at all will impair its proper function to a proportionate degree.¹⁴³

(2) *Drugs*. When efforts are made with drugs to sustain blood pressure in a dead person, whose body is being maintained with life support devices, organ damage occurs. The intended operation of the drug causes severe constriction of the blood vessels.¹⁴⁴ It has been suggested that kidneys in which such constriction has taken place should be discarded.¹⁴⁵

(3) *Agonal incidents*.¹⁴⁶ The body itself, before it dies, makes desperate efforts to save itself. In the process, changes take place¹⁴⁷ as a result of nerve, hormone, electrolyte, and metabolic activity that, if prolonged, will result in damage similar in some respects to that caused by drugs.¹⁴⁸

(4) *The vital need for tissue typing*.¹⁴⁹ Today, the major impediment in organ transplantation is not surgical technique, but rather the rejection of the transplanted organ by the recipient's body.¹⁵⁰ The sever-

139. Cooper & Mitchell, *Cardiac Transplantation: Current Status*, 1 TRANSPLANTATION PROCEEDINGS 755 (1969). It is entirely likely that, once the new definition of death is universally accepted, the legal, moral, and ethical foment will center upon the mortality caused by failure to make cadavers available for donation of organs that offer life to recipients and are worthless to donors.

140. Anoxia: Without oxygen.

141. Shumway, *et al.*, *Organ Viability with Hypothermia*, 58 J. THORACIC & CARDIOVASCULAR SURGERY 619 (1969).

142. Katz, *Kidney Transplantation: Patient Selection and Management*, 54 MED. CLINICS N.A. 75, 81 (1970). In the kidneys, the result is acute tubular necrosis, a common cause of transplanted kidney malfunction that is characterized by death of the small tubes that make up part of the filtering mechanism of the kidney. In the heart, time is more critical with damage occurring after anoxia of more than 30 minutes at normal body temperature. Childs & Lower, *Preservation of the Heart*, 12 PROGRESS IN CARDIOVASCULAR DISEASES 149, 157 (1969).

143. William & Hanlon, *Structural and Functional Changes in Cardiac Transplants*, 1 TRANSPLANTATION PROCEEDINGS 713, 714 (1969).

144. Balzer, *et al.*, *Cause of Renal Injury in Kidneys Obtained from Cadaver Donors*, 130 SURGERY, GYNECOLOGY & OBSTETRICS 467, 477 (1970). "These studies have demonstrated that vasoconstriction . . . is the major cause of acute tubular necrosis after cadaver renal homotransplantation." Anoxia also contributes to vasoconstriction.

145. *Id.*

146. Agonal: Taking place during the process of death.

147. Shumway, note 141 *supra* (in a comment by Dr. John Kennedy at 636).

148. DePasquale & Burch, *How Normal Is the Donor Heart?*, 77 AM. HEART J. 719 (1969).

149. Rapaport & Dausset *Immunological Principles of Donor Selection for Human Cardiac Transplantation*, 12 PROGRESS IN CARDIOVASCULAR DISEASES 119 (1969). The study of the phenomena of tissue rejections is called "immunology." The problems inherent in tissue rejection must be solved or there can be little long-range benefit from organ transplantation.

150. Goodwin & Oakley, *Transplantation of the Heart*, 77 AM. HEART J. 437, 438 (1969). Published by UF Law Scholarship Repository, 1970

ity of rejection can be lessened if donor and recipient tissues are closely matched.¹⁵¹ In the past¹⁵² it has been necessary to use any donor who became available, regardless of the tissue match.¹⁵³ With development of preservation techniques,¹⁵⁴ however, it is now possible to form a central registry¹⁵⁵ and rush donor organs to closely matched recipients.¹⁵⁶ In order for this system to work, organs must be removed as soon after death as possible.¹⁵⁷

As medical problems are gradually resolved the remaining legal impediments¹⁵⁸ become more prominent. Even when the legal problems are resolved, there will remain the major practical problems of obtaining an adequate supply of donor organs¹⁵⁹ and defraying expenses.¹⁶⁰

CONCLUSIONS

The introduction of cadaver organ transplantation into medical practice has created a need for reevaluation of traditional definitions of death. For legal purposes, death has for centuries been defined as the total and irreversible cessation of respiration and circulation. No legislature or court has faced a situation in which a departure from this definition has been necessary. However, the medical community has recently developed the ability to

All of the tissues of the body are not rejected by another body with the same degree of vigor. The skin and kidney are highly reactive and therefore are quickly rejected. The liver is relatively well tolerated; the heart falls somewhere in between. It seems that structures such as the cornea and heart valves, which have little or no direct blood circulation are not rejected.

151. Hallman, *et al.*, *Factors Influencing Survival After Human Heart Transplantation*, 170 ANN. SURGERY 593, 595 (1969).

152. Moore & Hume, *The Period and Nature of Hazard in Clinical Renal Transplantation: 1. The Hazard to Patient Survival*, 170 ANN. SURGERY 1 (1969). In 97 transplants where the tissue was typed, matching had no bearing on donor-recipient selection because of the absence of a pool of organs from which to select. This is similar to giving blood transfusions to patients without regard to matching the types.

153. Dole, *Ethical Aspects and Sociological Implications of Organ Transplantation as a Therapeutic Procedure*, 63 NAT'L ACADEMY SCI. PROCEEDINGS 1034, 1037 (1969). In the random use of donors, the chance of getting a good tissue match is between one in 50 and one in 150. The chance of rejection is the reverse of this ratio. *Id.* at 1037.

154. Johnston, *Advances in Surgery*, 203 THE PRACTITIONER 418, 419 (1969).

155. Dole, *supra* note 153, at 1037. With rapid removal and cooling, time will be available to consult a central registry and determine whether a recipient is in need of an organ with this tissue type.

156. Katz, *supra* note 142, at 91.

157. Dole, *supra* note 153, at 1037. *See also* Johnston, note 154 *supra*.

158. Probably, the eventual solution will be to allow proper hospital authorities to remove desired organs from *all* decedents unless they expressed opposition to this during life. If the family objected to organ removal on any ground, they would be entitled to step forward and prevent it. Absent such showing, medical authorities could remove organs without any prior consent. For a thorough discussion based on this concept, *see* Sanders & Dukeminier, *Medical Advance and Legal Lag*, 15 U.C.L.A.L. REV. 357 (1968).

159. Johnston, *supra* note 154, at 420.

160. *Symposium, supra* note 123, at 96. Currently, the cost of a kidney removal and cooling operation is about \$25,000.

maintain a patient's respiration and circulation indefinitely, even when the brain is no longer viable and the patient therefore has no chance of survival. These dead bodies containing organs that, except for the brain, still live are needed as organ donors. While alive by legal criteria, these patients are dead by the more modern medical criteria of brain death, which are increasingly used by the medical profession in virtually every center where transplantation of organs is taking place today. As a practical matter, use of brain death criteria provides the only feasible way of obtaining usable organs for transplantation. The supply of such organs is not presently adequate to meet the current demand.

In order to help solve this problem, Florida and forty other states have enacted the Uniform Anatomical Gift Act, which allows testamentary disposition of one's body or, failing this, allows the next of kin to donate the body or authorize removal of needed organs from the donor after death. The principal defect in the Uniform Act is its failure to adopt or sanction the new criteria for death determination currently in use in the medical profession. Lacking this authorization, transplant surgeons are exposing themselves to enormous legal risks by the current practices of removing cadaver hearts that are spontaneously beating or removing vital organs from cadavers with spontaneously beating hearts, then discontinuing respiratory support. Legally, if traditional definitions for death are applied, this is homicide. It is not reasonable to require that physicians assume these risks. Society should accept part of the responsibility through legislation allowing for definitions of death other than the archaic cessation of respiration and circulation.

PROPOSAL

There is no need for a specific legislative definition of death. Such an effort would be futile in that the use of a flexible definition is required for differing circumstances. There is also the likelihood that currently accepted medical definitions will change or expand in the future or that medical science will discover new methods of death determination. What is needed is legislative recognition that, if done without negligence, physicians may apply criteria other than cessation of respiration and circulation in death determination without fear of adverse legal consequences.

This goal may be accomplished by an amendment to the Uniform Anatomical Gift Act, subsection 736.28 (2), deleting the last sentence and substituting: "If cadaver organs or parts are to be used for transplantation, and if death is to be determined by criteria other than irreversible cessation of heartbeat and respiration, such determination must be made by two concurring physicians, neither of whom shall participate in the transplantation procedures."

This provision provides the needed flexibility and at the same time insures additional protection to the prospective donor by requiring that two physicians concur before death is pronounced.

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