

Spring 1973

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William F. Arnet

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Comments

THE CRITERIA FOR DETERMINING DEATH IN VITAL ORGAN TRANSPLANTS—A MEDICO-LEGAL DILEMMA

I. INTRODUCTION

In May of 1972, the jury in *Tucker's Administrator v. Lower*¹ returned a verdict in favor of a defendant heart transplant surgeon in a wrongful death action brought by the donor's brother. This was the nation's first court decision involving a heart transplant. The judge gave an instruction, unprecedented in medico-legal history, that allowed the jury to use cessation of brain function as a possible definition of death. Specifically, the instruction stated three possible criteria for death of the donor: (1) Total lack of circulation; (2) cessation of other vital functions, such as respiration and pulse; and (3) complete, irreversible loss of brain function. The instruction also allowed the jury to consider whether any of these functions were spontaneous or were artificially maintained.² The jury found that the surgeon had not caused the donor's death by removing him from a respirator after his brain had ceased to function. Considering the criteria of death furnished the jury by the court's instruction, it is apparent from their decision that the jury was guided by the irreversible loss of brain function portion of the instruction.

Recent medical advances in the field of vital organ transplantations³ have raised complex legal, medical, and ethical questions concerning the concept of death. When is a donor actually dead so that his organs can be removed and transplanted into a living patient? Traditionally, death has been associated with the cessation of heartbeat and respiration. The classical medical and legal definitions of death are based on this idea. How-

1. No. 2831 (Ct. Law & Eq., Richmond, Va., May 25, 1972). A complete account of the case is presented in Mosher, *When Does Life End?*, *The National Observer*, June 3, 1972, at 1, col. 1.

2. The instruction given by the judge in *Tucker* reads as follows:

The court instructs the jury that you shall determine the time of death in this case by using the following definition of the nature of death. Death is a cessation of life. It is the ceasing to exist. Under the law, death is not continuing but occurs at a precise time and that time must be established according to the facts of each specific case.

In determining the time of death, as aforesaid, under the facts and circumstances of this case, you may consider the following elements, none of which should necessarily be considered controlling, although you may feel under the evidence that one or more of these conditions are controlling: the time of the total stoppage of the circulation of the blood; the time of the total cessation of the other vital functions consequent thereto, such as respiration and pulsation; the time of complete and irreversible loss of all function of the brain; and, whether or not the aforesaid functions were spontaneous or were being maintained artificially or mechanically.

3. A vital organ transplantation is one that requires a dead donor. Hence, transplants of heart, liver, or lungs are vital organ transplantations.

ever, the advancement of new methods to support cardiac and respiratory functions artificially has caused the medical profession to reevaluate the traditional criteria of death. As a result, the concept of brain death is gaining support in the medical profession.

This comment discusses the issue of defining when a person is dead in light of the new discoveries concerning the functioning of man's brain. The medical community is presently in a state of flux over the criteria that should be employed to determine brain death, and the law has generally resisted any change in the present legal definition of death. The article analyzes the medical profession's problems in changing to a brain death definition and the arguments over what criteria should be adopted to facilitate the change. The present legal definition of death is also examined, along with the attendant legal problems that may develop if law and medicine apply different criteria to determine death.

Although there are many legal problems in the area of vital organ transplantation other than the determination of when the donor is dead, this comment deals exclusively with the issue of the definition of death. It does not discuss the problems of consent,⁴ incompetent donors,⁵ or the ethical considerations surrounding the transplantation of vital organs.⁶

II. MEDICAL DEFINITIONS OF DEATH—PRESENT AND FUTURE

Current definitions of death found in various medical dictionaries and encyclopedias revolve around one central theme: the cessation of all vital functions of the human body.⁷ In formulating the criteria for determining death, these traditional medical definitions do not isolate the function of any one organ; rather, they emphasize the total stoppage of all vital bodily functions. The medical profession has characterized this total stoppage of vital functions more concretely as the combined cessation of heartbeat and

4. For articles dealing with this problem, see Curran, *A Problem of Consent: Kidney Transplantation in Minors*, 34 N.Y.U.L. REV. 891 (1959); Fletcher, *Human Experimentation: Ethics in the Consent Situation*, 32 LAW & CONTEMP. PROB. 620 (1967); Jaffe, *Law as a System of Control*, 98 DAEDALUS—J. AM. ACAD. ARTS & SCI. 423 (1969); Samansky, *Tissue and Organ Transplants in Human Beings*, 19 BROOKLYN BARRISTER 172 (1968); Stason, *The Role of Law in Medical Progress*, 32 LAW & CONTEMP. PROB. 563 (1967); Ritts, Plante, Ratnoff, Smith, J., Sharpe, Hargest & Smith, D., *A Symposium: Some Legal Problems in Medical Treatment and Research*, 36 FORDHAM L. REV. 631 (1968); Comment, *Jurisdiction, Incompetent Donor's Consent to a Kidney Transplant*, 10 WASHBURN L.J. 157 (1970); Comment, *Informed Consent as a Theory of Medical Liability*, 1970 WIS. L. REV. 879 (1970).

5. For articles dealing with this problem, see Note, *Transplantation—Incompetent Donors*, 58 CALIF. L. REV. 754 (1970); Dyer, *Kidney Transplant—Mentally Incompetent Donor*, 35 MO. L. REV. 538 (1970).

6. For articles discussing this point, see Page, *The Ethics of Heart Transplantation*, 207 A.M.A.J. 109 (1969); Perper, *Ethical, Religious, and Legal Considerations to Transplantation of Human Organs*, 15 J. FOR. SCI. 1 (1970); Shelley, *Ethical Guidelines for Organ Transplantation*, 205 A.M.A.J. 341 (1968).

7. For a brief survey of the various medical definitions of death, see Halley & Harvey, *On an Interdisciplinary Solution to the Legal-Medical Definitional Dilemma in Death*, 2 IND. LEGAL F. 219 (1969); Hannah, *The Signs of Death: Historical Review*, 28 N.C. MED. J. 457 (1967).

respiration.⁸ For example, *Dorland's Illustrated Medical Dictionary* defines death as "[t]he apparent extinction of life, as evidenced by absence of heart-beat and respiration."⁹ *Blackiston's New Gould Medical Dictionary* defines death as "[t]he cessation of life, beyond the possibility of resuscitation."¹⁰ These classical medical definitions of death give no special significance to the vital function of the brain. This is probably the result of two factors: First, the medical profession's desire to place the definition of death on an integrated basis, stressing the idea of total stoppage of bodily functions; and, second, the formulation of these definitions during a time when medical science knew little about the processes of the human brain and considered the heart to be the center of the body's functions.¹¹ When the heart stopped beating, respiration would cease; and the mysterious organ called the brain would stop functioning soon thereafter. Since the brain ceased to function at some time after the heart stopped beating, there seemed to be no necessity to determine the precise time at which brain activity ceased.

However, the development of electrical shock treatment, cardiac pace-makers, and resuscitators disturbed the above sequence of events. For example, a patient could have a heart attack, suffer complete cardiac arrest, and yet be resuscitated. Furthermore, it became possible to maintain a patient's respiratory activity on machines, though he had no hope of recovery due to severe brain damage. Dr. Carl Wasmuth¹² best described these advances when he wrote:

With the technological advances in medicine, it is possible to maintain by mechanical means both the heartbeat and the respiration. A cardiac pacemaker, with a self-contained power source, can be implanted under the skin of the trunk of the body and the wires connected to the heart muscle. By rhythmic discharge of the electrical current of this pacemaker, the heart is stimulated to contract, thus maintaining circulation of the blood. In certain individuals, "life" as classically defined is extended by artificial means. Likewise, the significant advances in the ventilatory equipment now permit physicians, particularly in the intensive care units of hospitals, to maintain respiratory excursions in patients who have suffered respiratory arrest. Thus, in many instances death is thwarted by the simple expedience of supporting by mechanical means the two vital processes described in the above definition [the present medical definitions], the absence of which is defined as death.¹³

8. Gorney, *The New Biology and the Future of Man*, 15 U.C.L.A.L. REV. 273 (1968); Wasmuth, *The Concept of Death*, 30 O.S.U.L.J. 32 (1969).

9. Halley & Harvey, *supra* note 7, at 230, citing DORLAND'S ILLUSTRATED MEDICAL DICTIONARY 387 (29th ed. 1965).

10. BLACKISTON'S NEW GOULD MEDICAL DICTIONARY 274 (1st ed. 1951).

11. See Beecher, *Scarce Resources and Medical Advancements*, 98 DAEDALUS—J. AM. ACAD. ARTS & SCI. 291 (1969); Hannah, *supra* note 7, at 460; Wasmuth, *supra* note 8, at 46.

12. Dr. Wasmuth is a Senior Consultant, Dep't of Anesthesiology, Cleveland Clinic Hospital, and Adjunct Professor of Law, Cleveland-Marshall College of Law.

13. Wasmuth, *The Medical, Legal and Ethical Considerations of Human Organ Transplantations*, 11 WM. & MARY L. REV. 636, 648-49 (1970). For discussions of the effect of these advancements, see Biorck, *When is Death?*, 1968 WIS. L. Published by University of Missouri School of Law Scholarship Repository, 1973

Study of the human brain has revealed that the nerve cells of the cerebral cortex¹⁴ can survive anoxia¹⁵ for no more than 3 to 6 minutes, after which the brain can no longer function in its capacity of reasoning and thinking.¹⁶ The mid-brain and brain stem, which control vital bodily functions, including spontaneous heartbeat, can withstand a lack of oxygen supply for only 15 minutes. Thus, when a patient's heart stops, his brain will be irreversibly damaged, unless its oxygen supply is quickly restored. If all parts of the brain cease to function, the heart can no longer beat *spontaneously*, since the brain controls this function.¹⁷

Yet, cardiac resuscitation by artificial means is still possible at this point, and the patient's heartbeat and respiration may be maintained by machines, though his brain is completely nonfunctional. This paradoxical situation has indicated to the medical profession that the present criteria for determining death is unsatisfactory, and has prompted a majority of physicians to urge the adoption of some type of brain death definition.¹⁸ Thus, physicians assert that when the brain activity ceases and spontaneous respiration and heartbeat cease, the individual is dead.¹⁹

The advent of cardiac transplantation in the early 1960's provided the real impetus toward a change in the traditional definitions of death.

REV. 484, 493; Castel, *Some Legal Aspects of Human Organ Transplantation in Canada*, 46 CAN. B. REV. 345, 351 (1968); Wasmuth & Stewart, *Medical and Legal Aspects of Human Organ Transplantation*, 14 CLEV.-MAR. L. REV. 442 (1965); Comment, *California's Response to the Problems of Procuring Human Remains for Transplantation*, 57 CALIF. L. REV. 671, 689 (1969); Comment, *The Need for a Redefinition of Death*, 45 CHI.-KENT L. REV. 202 (1968); Note, *Human Organ Transplantation: Some Medico-Legal Pitfalls for Transplant Surgeons*, 23 U. FLA. L. REV. 134, 142 (1970).

14. The cerebral cortex is the main part of the brain, situated in the upper part of the cranium, and consisting of two equal parts known as hemispheres. The main function of the cerebral cortex is to control voluntary and conscious activity. See SCHMIDT'S ATTORNEY'S DICTIONARY OF MEDICINE, C-49 (1st ed. 1972).

15. Anoxia is "[t]he condition in which the oxygen content of the cells and tissues of the body is below normal." SCHMIDT'S ATTORNEY'S DICTIONARY OF MEDICINE, A-170 (1st ed. 1972).

16. Biorck, *supra* note 13, at 493; Ford, *Human Organ Transplantation: Legal Aspects*, 15 CATH. LAW. 136, 140 (1969); Wasmuth, *supra* note 8, at 36; Comment, *Medico-Legal Problems with the Question of Death*, 5 CALIF. W.L. REV. 110, 116-17 (1968).

17. For a discussion of the effect on other bodily functions of cessation of brain activity, see, Ad Hoc Committee at Harvard Medical School to Examine the Definition of Brain Death, *A Definition of Irreversible Coma*, 205 A.M.A.J. 337 (1968).

18. See Appel, *Ethical and Legal Questions Posed by Recent Advances in Medicine*, 205 A.M.A.J. 513 (1968); Ayd, *When is a Person Dead?*, 4 LAWYERS' MED. J. 81 (1968); Beecher, *supra* note 11, at 291; Cooley, *Minutes of the Cape Town Meeting*, 9 MED. WORLD NEWS 21 (Aug. 9, 1968); Randall & Randall, *The Developing Field of Human Transplantation*, 5 GONZAGA L. REV. 20 (1969); Richards, *Medical-Legal Problems of Organ Transplantation*, 21 HASTINGS L.J. 77 (1969); Sadler & Sadler, *Transplantation and the Law: The Need for Organized Sensitivity*, 57 GEO. L.J. 5 (1968); Editorial, *When is a Patient Dead?*, 204 A.M.A.J. 1000 (1968); Note, *Death with Dignity: A Recommendation for Statutory Change*, 22 U. FLA. L. REV. 368 (1970).

19. See Moore, *infra* note 23, at 386; Comment, *supra* note 16, at 123; Note, *Law and Life: Organ Transplants*, 20 S. CAR. L. REV. 765 (1968).

The conditions essential for vital organ transplantation, plus the shortage of such organs as the heart, liver, and lungs available for transplantation, brought into focus the inadequacy of the existing medical definitions of death.

The dilemma faced by the transplant surgeon becomes apparent from an examination of the requirements of a successful vital organ transplant. Simply stated, a vital organ transplant requires a live organ in a dead donor. Time is of the essence in maintaining the vitality of the organ being transplanted.²⁰ It is estimated that the surgeon has only 10 minutes to remove a heart, liver, or lung from the donor and transplant it into the donee.²¹ The stoppage of heartbeat and respiration criteria in the present classical definition of death would require the cessation of circulation in the donor before the surgeon could remove the organ. At this stage, the vital organ would have already begun to deteriorate, thus significantly reducing the probability of a successful transplant.²² In addition, a transplant surgeon functioning under the classical criteria of death was often forced to watch a patient die while a potential donor, with no hope of regaining consciousness, was maintained by artificial means until further complications developed and his heart and respiration finally ceased.²³ In contrast, a transplant surgeon applying a brain death definition could remove an organ even though the donor's circulation was still being maintained artificially. This could greatly increase the probability that a transplant operation would be successful.

III. THE PROPOSED CRITERIA FOR DETERMINING BRAIN DEATH

Although a majority in the medical profession agree that a definition of death based on irreversible loss of brain function must be adopted, there is extensive argument over what should be the specific criteria for determining brain death. A number of criteria for determining brain death have been proposed. These proposed criteria have certain common factors, including the absence of spontaneous respiration and muscular movement, absence of all reflexes, and an isoelectric (flat) electroencephalogram (EEG) reading.²⁴ Despite their similarities, real differences exist among these proposed definitions of brain death. Before any generally accepted criteria can emerge, the medical profession must resolve these

20. Stickel, *Organ Transplantation in Medical and Legal Perspectives*, 32 LAW & CONTEMP. PROB. 597 (1967).

21. Wasmuth, *supra* note 8, at 36.

22. Corday, *Death in Human Transplantation*, 55 A.M.A.J. 629 (1969).

23. See Moore, *Medical Responsibility for the Prolongation of Life*, 206 A.M.A.J. 384 (1968); McCleave, Collins, Lewis, Provonsha & Moore, *Symposium: 'When Do You Pull the Plug?'*, 205 A.M.A.J. 29 (1968).

24. An EEG reading is obtained by attaching electrodes to the patient's head and examining the brain wave produced on a monitor. For articles discussing the operation of the electroencephalogram, see Green, *What Constitutes Legal Death?*, 61 J. IND. ST. MED. ASS'N 1120, 1122 (1968); Hamlin, *Life or Death by EEG*, 190 A.M.A.J. 112 (1964); Editorial, *supra* note 18, at 1000; Note, *supra* note 13, at 147.

Isoelectric is defined as "[h]aving the same or an equal electric potential (as another point of reference); having the same voltage and the same polarity." This situation produces a flat line across the electroencephalogram. SCHMIDT'S ATTORNEY'S DICTIONARY OF MEDICINE 487 (1st ed. 1972).

differences. This section examines four proposed sets of criteria for determining brain death, as well as some additional factors advanced by others in the medical field.²⁵

In 1968, an Ad Hoc Committee on Human Tissue Transplantation meeting at Duquesne University Law School proposed the following definition of brain death:

- I. Documentation of Death.
 - A. Lack of responsiveness to external and internal environment.
 - B. Absence of spontaneous breathing movements for three minutes
 - C. No muscular movements
 - D. Reflexes and Responses
 1. Pupils fixed and dilated
 2. Corneal reflexes absent.
 3. Supraorbital and other pressure response absent
 4. Absence of snouting and sucking responses.
 5. No reflex response to upper airway stimulation.
 6. No reflex response to lower airway stimulation.
 7. No ocular response to ice water stimulation of inner ear.
 8. No deep tendon reflexes.
 9. No superficial reflexes.
 10. No plantar responses.
 - E. Falling arterial pressure without support by drugs or other means.
 - F. Isoelectric electroencephalogram Multiple recordings totalling at least thirty minutes
- II. Certification of Death
 - A. Criteria A through F should be present for at least two hours before death is certified.
 - B. Death should be certified and recorded by two physicians other than the physicians of a potential organ recipient.²⁶

It is significant that the Pittsburgh Committee's definition requires an isoelectric EEG reading for 30 minutes. Also significant is the requirement that the patient be reexamined 2 hours after the initial tests to determine if the factors for documenting brain death are still present.

Mr. S. D. Rosoff, a New York attorney, and Dr. R. S. Schwab²⁷ developed the following criteria for diagnosing irreversible coma:²⁸

- (1) no reflexes, spontaneous breathing, or muscle activity;

25. Further sets of criteria not discussed in this section can be found in Gordon, *The Biological Definition of Death*, 15 J. FOR. MED. 5 (1968); Halley & Harvey, *supra* note 7, at 225; McCutcheon, *A Neurologist Looks at Death*, 204 A.M.A.J. 1197 (1968); Randall & Randall, *supra* note 18, at 35-36; Wasmuth, *supra* note 13, at 651; Comment, *Liability and the Heart Transplant*, 6 Hous. L. REV. 85, 99 (1968).

26. Wecht & Aranson, *Medical-Legal Ramifications of Human Tissue Transplantation*, 18 DEPAUL L. REV. 488, 493-94 (1969).

27. Dr. Schwab is presently Director of the Massachusetts General Hospital Brain Wave Laboratory.

28. The term "irreversible coma" is used throughout the article as being synonymous with brain death.

- (2) no clinical or EEG response to noise or a pinch; and
- (3) repetition of the above twenty-four or forty-eight hours later. These determinations were not to be made under conditions of hypothermia or anesthetic levels.²⁹

It is important to note that this definition specifies neither the length of time spontaneous breathing must cease nor the length of time the flat EEG must be observed. Also, the tests are to be repeated 24 to 48 hours later before pronouncing the brain dead.

The World Medical Association drafted the following set of criteria for determining brain death at its meeting in Sydney, Australia, in 1968:

- (1) Total lack of response to external stimuli, even the most painful that can be ethically applied;
- (2) Absence of all spontaneous muscular movements, notably breathing. If the patient is on a mechanical respirator, this may be turned off for three minutes in order to establish that he is capable of breathing himself;
- (3) Absence of reflexes. The dilated pupils must not contract when a bright light is shone directly into them. There must be no eye movements in response to pouring ice water into the ears, no muscular contraction of the biceps, triceps, or quadriceps;
- (4) Flat encephalogram or absence of brain waves.³⁰

This proposal does not require a time limit for the existence of the flat EEG reading, nor does it require a repeat of the tests at any time after the initial examination in order to document brain death.

The criteria of irreversible coma drafted by the Ad Hoc Committee of the Harvard Medical School to Examine the Definition of Brain Death contains the following elements:

- A. Unreceptivity and Unresponsivity
There is total unawareness to externally applied stimuli and inner need and complete unresponsiveness . . . Even the most intensely painful stimuli evoke no vocal or other response . . .
- B. No Movements or Breathing
Observations covering a period of at least one hour by physicians is adequate to satisfy the criteria of no spontaneous muscular movements or spontaneous respiration or response to stimuli such as pain, touch, sound, or light. After the patient is on a mechanical respirator, the total absence of spontaneous breathing may be established by turning off the respirator for three minutes and observing whether there is any effort on the part of the subject to breathe spontaneously.
- C. No Reflexes
Irreversible coma with abolition of central nervous system activity is evidenced in part by the absence of elicitable reflexes.
- D. Flat Electroencephalogram
Of great confirmatory value is the flat or isoelectric EEG. . . . At least ten full minutes of recording are desirable, but twice that would be better.
. . . .

29. Corday, *supra* note 22, at 629.

30. Comment, *supra* note 16, at 119-20.

All of the above tests shall be repeated at least twenty-four hours later with no change.³¹

The Harvard irreversible coma criteria seems to have received the most widespread support from the medical community. This proposal appears to be more specific in all its aspects than the prior definitions. This set of criteria specifies only a 10- to 20-minute flat EEG reading, and requires that the tests be performed again at least 24 hours after the first series of examinations before irreversible coma can be effectively diagnosed.

The greatest difference among these four criteria concerns the interval required between the initial series of tests and the reexamination of the patient to determine if the symptoms are still present.³² Other than the World Medical Association proposal, which requires no repetition of the tests after the initial series, the time factor ranges from 2 to 24 hours.³³ Advocates of the Pittsburgh Committee's criteria argue that waiting longer than 2 hours is not justified and may hamper transplant efforts.³⁴ On the other hand, supporters of the Harvard criteria contend that reducing the period below 24 hours would not allow enough observation time to insure that the person has truly lapsed into irreversible coma.³⁵

A dispute also exists among the proponents of the above proposals, and in the medical community as a whole, concerning the effectiveness of the electroencephalogram in diagnosing lack of brain activity. The disagreement centers on how much weight should be given the flat EEG reading in diagnosing irreversible coma, and how long it must persist to indicate effectively absence of brain activity. Research conducted by encephalographers since the formulation of the various brain death criteria may be helpful in settling the dispute. Dr. Henry Beecher has examined 3,000 cases in which the EEG reading was isoelectric for 24 hours or more without a single recovery.³⁶ Such empirical evidence supports the inclusion of EEG readings as part of any brain death definition, but the dispute still rages over the time period a flat EEG reading must persist to indicate a non-functioning brain. Suggested time periods include ten minutes,³⁷ thirty

31. Ad Hoc Committee of the Harvard Medical School to Examine the Definition of Brain Death, *A Definition of Irreversible Coma*, 5 U. SAN FRAN. L. REV. 283 (1971).

This committee consisted of the following members: Henry K. Beecher, M.D., Chairman; Raymond D. Adams, M.D.; A. Clifford Barger, M.D.; Williams J. Curran LL.M., Sm. Hyg.; Derek Denny-Brown, M.D.; Dana L. Farnsworth, M.D.; Jordi Folch-Pi, M.D.; Everett I. Mendelsohn, Ph.D.; John P. Merrill, M.D.; Ralph Potter, Th.D., Robert Schwab, M.D.; and William Sweet, M.D.

32. *Determination of Death*, LANCET 1092 (1970).

33. One commentator has suggested that waiting even as short as 2 hours will hamper transplant efforts. See Shapiro, *Criteria for Determining that Death has Occurred*, 16 J. FOR. MED. 1 (1969).

34. Wecht, *Attorney Describes Current Efforts to Establish Uniform Guidelines*, 43 HOSP. 54 (1969).

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

36. *Id.* at 1071.

37. See Ad Hoc Committee of the Harvard Medical School to Examine the Definition of Brain Death, *supra* note 31, at 283.

minutes,³⁸ and one hour.³⁹ A majority of experts do agree, however, that an isoelectric EEG reading alone is an insufficient basis for ascertaining brain death.⁴⁰ It is also generally agreed that for the EEG reading to constitute effective evidence of absence of brain activity, there must be no central nervous system depressant drugs in the patient's system, nor can the patient be experiencing hypothermia.⁴¹ Certain factors have been proposed in addition to those outlined in the above four sets of criteria. Dr. Shalit of Israel suggests that the measure of oxygen consumption of the brain should be included as a factor in determining brain death.⁴² Physicians at Johns Hopkins University agree, and consider oxygen consumption below 10 percent of normal to be an essential criterion in any definition of brain death.⁴³ These physicians argue that extremely low oxygen consumption by the brain indicates lack of intracranial circulation, without which the brain cannot function. In addition, physicians and medical societies in Belgium,⁴⁴ Great Britain,⁴⁵ Austria,⁴⁶ Germany,⁴⁷ and France⁴⁸ have developed criteria for determining brain death, all of which differ in some respects from the four proposals discussed in this section.

It is apparent from this analysis that, although there exists a consensus in the medical profession favoring the adoption of a definition of death based on the nonfunctioning brain, a deep division remains as to what specific criteria should be adopted to define brain death. As long as this diversity of opinion exists within the medical profession, it is unlikely the law will alter its present definition of death in favor of brain death.

IV. LEGAL ASPECTS OF THE DEFINITION OF DEATH

A. *The Present Legal Definition of Death*

The present legal definition of death is based on the classical medical definitions developed when little was known about the functioning of the brain. Consequently, the definition is structured in terms of cessation of heartbeat and respiration. *Black's Law Dictionary* defines death as

[t]he cessation of life; the ceasing to exist; defined by physicians as the total stoppage of the circulation of the blood, and a cessation of the animal and vital functions consequent thereon, such as respiration, pulsation, etc.⁴⁹

38. See Wecht & Aranson, *supra* note 26, at 493.

39. See Comment, *supra* note 25, at 99.

40. See Moore, *supra* note 23, at 384; Silverman, Saunders, Schwab & Masland, *Cerebral Death and the Electroencephalogram*, 209 A.M.A.J. 1505 (1969); Comment, *supra* note 16, at 120.

41. Hypothermia is "[a]bnormally low temperature of the body." SCHMIDT'S ATTORNEY'S DICTIONARY OF MEDICINE 441 (1st ed. 1972).

42. Wecht & Aranson, *supra* note 26, at 491.

43. Walker, *The Death of a Brain*, 124 JOHNS HOPKINS MED. J. 190 (1969).

44. Halley & Harvey, *supra* note 7, at 232.

45. *Id.*

46. *Transplant Rounds*, 10 MED. WORLD NEWS 340 (Sept. 26, 1969).

47. International Comments, *Recommendation by the German Society of Surgery*, 203 A.M.A.J. 998 (1968).

48. Comment, *supra* note 16, at 120.

49. BLACK'S LAW DICTIONARY 488 (Rev. 4th ed. 1968).

Courts have naturally relied upon this definition in determining the occurrence of death. In several cases the courts directly cited the above definition in support of their decisions.⁵⁰ In numerous other cases, appellate courts have upheld lower court determinations that an individual was dead based on cessation of heartbeat and respiration, although they did not specifically cite the accepted legal definition.⁵¹ In these cases, if there was any evidence referring to the possible existence of heartbeat, circulation, or respiration, the courts ruled that the individual was still alive. For example, in *Taylor v. Cawood*,⁵² *Prudential Insurance Co. of America v. Spain*,⁵³ and *In re Davenport's Estate*,⁵⁴ all survivorship cases, the courts based their decisions on witnesses' observations of the victims gasping for air or making a gurgling sound. In holding that there was sufficient evidence to find that the victims were still alive when seen by the witnesses, the courts were obviously of the opinion that respiration was still present. In *Evans v. Halterman*⁵⁵ the court held that there was adequate evidence to find that the victim of an auto accident was still alive based on a witness's statement that he detected what he *thought* was a slight heartbeat in the individual. The court in *Sauers v. Stolz*⁵⁶ accepted a witness's testimony that blood was spurting from the victim's body as evidence sufficient to establish the presence of a heartbeat.

B. Rejection of Cessation of Brain Activity as a Criterion for Determining Death

Several cases have not only supported the cessation of heartbeat and respiration criteria, but have also rejected cessation of brain activity as an additional criterion of death. In *Vaegemast v. Hess*,⁵⁷ the Minnesota Supreme Court accepted a coroner's testimony that the victim's heart was constricted and empty of blood as sufficient to establish she was alive after her husband's death and refused to recognize evidence of the victim's destroyed cerebrum as determinative of death. Although that portion of the brain responsible for the reasoning and thinking processes of the victim was completely destroyed, the court refused even to consider this as evidence of death.⁵⁸ The strongest rejection of brain death came in *Gray v.*

50. See *Smith v. Smith*, 229 Ark. 622, 317 S.W.2d 275 (1958); *In re Estate of Schmidt*, 261 Cal. App. 2d 262, 67 Cal. Rptr. 847 (1968); *Thomas v. Anderson*, 96 Cal. App. 2d 371, 215 P.2d 478 (1950); *Schmitt v. Pierce*, 344 S.W.2d 120 (Mo. En Banc 1961).

51. See, e.g., *United Trust Co. v. Pyke*, 199 Kan. 1, 427 P.2d 67 (1967); *Glover v. Davis*, 366 S.W.2d 227 (Tex. 1963); *Telefilm v. Superior Ct.*, 194 P.2d 542 (Cal. App. 1948), *rev'd on other grounds*, 201 P.2d 811 (Cal. 1949); *Finch v. Edwards*, 239 Mo. App. 788, 198 S.W.2d 665 (St. L. Ct. App. 1946); *Sanger v. Butler*, 45 Tex. Civ. App. 527, 101 S.W. 459 (1907); *Stead v. Department of Labor & Indus.*, 188 Wash. 171, 61 P.2d 1307 (1936); cases cited notes 52-56 *infra*.

52. 211 S.W. 47 (Mo. 1919).

53. 339 Ill. App. 476, 90 N.E.2d 256 (1950).

54. 79 Idaho 548, 323 P.2d 611 (1958).

55. 31 Ohio App. 175, 165 N.E. 869 (1928).

56. 121 Colo. 456, 218 P.2d 741 (1950).

57. 203 Minn. 207, 280 N.W. 641 (1938).

58. *Id.* at 209, 280 N.W. at 643; *accord*, *White v. Taylor*, 155 Tex. 392, 286 S.W.2d 925 (1956).

Sawyer.⁵⁹ Although the victim was decapitated, the court nevertheless upheld a lower court finding that relied on a witness's testimony that blood was spurting from the victim's body as evidence that she was alive.⁶⁰ The court stated that "[t]he doctors told the court that a body is not dead so long as there is a heartbeat and that may be evidenced by the gushing of blood in spurts. This is so though the brain may have quit functioning."⁶¹

In *Smith v. Smith*⁶² the attorney for the appellant specifically argued that the victim of an auto accident was dead at the instant her brain ceased to function, although she was maintained on a respirator for 17 days thereafter. This case is significant in light of the present controversy in the area of transplantation, because it involved the use of artificial life-sustaining devices to keep the patient "alive." The court flatly rejected the brain death argument and held that a patient is alive unless his heartbeat and respiration have ceased. The court asserted that

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 [*Black's Dictionary*] definition existed.⁶³

Six years later, in *Douglas v. Southerwestern Life Insurance Co.*,⁶⁴ another case involving artificial means to keep the patient "alive" after his brain had ceased to function, the court also rejected an argument based on brain death. The significance of the *Smith* and *Douglas* cases lies in the courts' steadfast adherence to the legal definition of death, and their refusal to include cessation of brain function in that definition even though the patients' circulation and respiration were being maintained wholly by artificial means. The courts ignored the fact that the individuals would never regain consciousness.

Thus, with the exceptions of *Tucker's Administrator v. Lower*⁶⁵ and two state statutes that include brain death as part of the definition of death,⁶⁶ the law refuses to consider absence of brain activity in determining death. This prevailing attitude results from the fact that the legal definition of death was taken from accepted medical definitions.⁶⁷ The present medical definitions are based on cessation of heartbeat and respiration. Thus, until the medical profession settles on a basic criteria for determining brain death and alters its own definition of death, the courts

59. 247 S.W.2d 496 (Ky. App. 1952).

60. *Id.* at 497; accord, *Gugel's Adm'r v. Orth's Ex'r*, 314 Ky. 591, 236 S.W.2d 460 (Ky. App. 1950).

61. 247 S.W.2d at 497.

62. 229 Ark. 579, 317 S.W.2d 275 (1958).

63. *Id.* at 582, 317 S.W.2d at 279.

64. 374 S.W.2d 788 (Tex. Civ. App. 1964).

65. No. 2831 (Ct. of Law & Eq., Richmond, Va., May 25, 1972); text accompanying notes 1 & 2 *supra*.

66. See KAN. STAT. ANN. § 77-202 (Supp. 1971); MD. ANN. CODE art. 43, § 54F (Cum. Supp. 1972).

67. Collins, *Limits of Medical Responsibility in Prolonging Life*, 206 A.M.A.J. 389 (1968); Sanders & Dukeminier, *Medical Advance and Legal Lag: Hemodialysis and Kidney Transplantation*, 15 U.C.L.A.L. REV. 357, 409 (1968).

can hardly be expected to make a significant change.⁶⁸ Members of the medical profession who are urging the adoption of a definition of death based on irreversible coma recognize this dilemma. Two proponents of a brain death definition, M. Martin Harvey⁶⁹ and William F. Halley,⁷⁰ have stated:

The failure of authoritative medical writings to formulate precise and scientific definitions of death appear as the direct cause of similar defects in corresponding legal definitions, which have been taken from medical material.⁷¹

C. Possible Consequences of a Transplant Surgeon's Applying Brain Death Criteria

Despite the inability of the medical profession to settle on a single set of criteria for determining brain death, many surgeons are applying a brain death definition in their transplant operations.⁷² This situation can create many attendant legal problems for transplant surgeons. Possible civil and even criminal liability await these physicians.

1. Possible Criminal Liability of Transplant Surgeon for Homicide

No physician has ever been convicted of a criminal violation resulting from the removal of a vital organ. Nevertheless, in view of the prevailing legal definition of death, the transplant surgeon who removes a beating heart from a donor with irreversible loss of brain function incurs the risk of a possible charge of homicide. The difficulties faced by the doctor making a decision that the donor is dead on a brain death criteria are illustrated by the following statement made by John Miner, Deputy District Attorney of Los Angeles, in May of 1968:

[A]s the law now stands, it theoretically would be murder if a doctor took a vital organ from a body not dead by all three criteria (cessation of heartbeat, respiration and brain function). Any intentional shortening of life is illegal no matter how good the motive or how inevitable the death of the donor.⁷³

Moreover, the fact that no doctor has been held criminally liable is no

68. See Castel, *Some Legal Aspects of Human Organ Transplantation in Canada*, 46 CAN. B. REV. 345, 352 (1968); Grad, *Legislative Responses to the New Biology: Limits and Possibilities*, 15 U.C.L.A.L. REV. 480 (1968); Stickel, *Medicolegal and Ethical Aspects of Organ Transplantation*, 169 ANNUAL N.Y. ACAD. SCI. 362 (1970); Castel, *Legal Aspects of Human Organ Transplantation*, 78 AM. HEART J. 130 (1969); Note, *Human Organ Transplantation: Some Medico-Legal Pitfalls for Transplant Surgeons*, 23 U. FLA. L. REV. 134, 144 (1970).

69. Mr. Harvey is an Associate Professor of Law at Indiana University, Indianapolis Law School.

70. Dr. Halley is a Diplomate, American Board of Surgery; Fellow, American College of Surgeons; Residence and Private Practice of Surgery, Topeka, Kansas.

71. HARVEY & HALLEY, *On an Interdisciplinary Solution to the Legal-Medical Definitional Dilemma in Death*, 2 IND. LEGAL F. 219, 224 (1969).

72. Cooley, *Minutes of the Capetown Meeting*, 9 MED. WORLD NEWS 21 (Aug. 9, 1968); Note, *supra* note 68, at 149.

73. 114 CONG. REC. 12785 (1968).

guarantee that a court will not find a surgeon liable by using the present legal definition of death.⁷⁴

2. Possible Avoidance of Liability by the Person Who Initially Injures the Donor

In addition to potential criminal liability of surgeons for the removal of a vital organ, transplant operations can possibly have a bearing on homicide cases brought against one who initially injured a donor. If the court rejects a brain death definition, it can be argued that the donor's death was caused by the physician who turned off the respirator, rather than by the defendant who injured the donor in the first place. This question arose from a transplant operation performed in Houston in 1968. A surgeon removed the heart of a severely beaten donor who had suffered extensive brain damage. The physician based his decision that the donor was dead on the cessation of the donor's brain function. After the donor was pronounced dead, the viability of his heart was maintained through the use of a cardiac machine until it was removed by the surgeon. The county coroner, however, chose to certify the victim's death on the basis of the cessation of heartbeat. Thus, it would be possible for the assailant's attorney to argue that the victim's death was caused by the surgeon. The district attorney was faced with determining whether the defendant could be tried for homicide, when under the present legal definition of death the victim died under the transplant surgeon's knife.⁷⁵ An English jury faced a similar predicament in the unreported case of *In re Potter*.⁷⁶ In that case, an assault victim was maintained on a respirator until pronounced dead based on the absence of brain activity. The donor's kidney was then removed in a transplant operation. At trial, the jury found the defendant guilty of manslaughter and refused to find that the transplant operation had contributed to the victim's death. Despite this finding, the case illustrates the possible effect of a vital organ transplant on a homicide case. Whether an American court and jury will follow this lead is still an open question.

3. Possible Civil Liability of Transplant Surgeon in Wrongful Death Actions

The threat of civil liability faced by the transplant surgeon may be even greater than possible criminal liability.⁷⁷ Removal of a beating heart from a patient with irreversible coma raises the possibility of a wrongful death action against the transplant surgeon. Although the jury found in

74. For a discussion of the possible criminal liability faced by the transplant surgeon, see Castel, *supra* note 68, at 351; Harvey & Halley, *Medical v. Legal Definitions of Death*, 204 A.M.A.J. 423 (1968); Louisell, *The Procurement of Organs for Transplantation*, 64 NW. U.L. REV. 607 (1970); Perper, *Ethical, Religious, and Legal Considerations to Transplantation of Human Organs*, 15 J. FOR. SCI. 1 (1970); Randall & Randall, *The Developing Field of Human Transplantation*, 5 GONZAGA L. REV. 20 (1969); 114 CONG. REC. 8926 (1968).

75. For a discussion of the Houston case, see Ford, *Human Organ Transplantation: Legal Aspects*, 15 CATH. LAW. 136, 141 (1969); 114 CONG. REC. 14522 (1968).

76. 31 MEDICO-LEGAL J. 195 (1963).

77. Kutner, *Due Process of Human Transplants: A Proposal*, 24 U. MIAMI L. REV. 782 (1970).

favor of the doctor in the *Tucker* case, other plaintiffs may be successful in future wrongful death cases. If the courts refuse to allow the jury to consider brain death and require them to use the present legal definition of death, their decision will have to be for the plaintiff. Even more disturbing to the transplant surgeon is a survey reported in the American Medical Association Journal in 1968 indicating that the public in general does not associate cessation of brain function with death. The results of this survey were outlined as follows:

The public thinks of death in terms of cessation of cardiopulmonary functions. Two-thirds of individuals surveyed thought that death occurred when the heart stopped or breathing had ceased or both. Only nine percent thought of death in terms of irreversible loss of cerebral function.⁷⁸

The people interviewed in this survey are representative of those who will make up the juries hearing civil cases in this area. Thus, even if a court takes the *Tucker* approach and allows the jury to consider absence of brain activity as one criterion for determining the time of death, the survey indicates that a jury is still likely to reject this criterion. This probability would be eliminated only if the court accepted the brain death definition as the sole criterion for determining death.

V. CONCLUSION

The medical profession is reevaluating its traditional view that death occurs when the heart stops and respiration ceases. In the age of vital organs transplantations and artificial techniques to support cardiac and respiratory functions, a new concept of brain death is emerging within the medical profession.

It is clear, however, that the courts generally reject irreversible coma as a basis for pronouncing a patient dead. Yet many transplant surgeons use such a definition. The dangers involved in this situation for the doctors include possible civil or criminal liability. Moreover, the possibility exists that a person who initially injures a transplant donor will escape liability for his death if the transplant surgeon uses a brain death definition of death.

Two major questions remain unanswered at this time: When will medicine settle on a single criteria for brain death, and will the law follow this change if and when it comes? The information available indicates that the medical profession favors a change to brain death, but lack of unanimity on a standard may cause serious problems. As mentioned earlier, Kansas and Maryland have passed legislation implementing a brain death definition. Both statutes include cessation of brain function accompanied by lack of spontaneous respiration and heartbeat as part of the definition of death. However, both laws naturally refer to "the ordinary standards of medical practice" to determine when these conditions exist. Therefore, although these jurisdictions are willing to recognize brain death, they still look

78. Arnold, Zimmerman & Martin, *Public Attitudes and the Diagnosis of Death*, 206 A.M.A.J. 1949 (1968).