

Defining Death

Medical, Legal and
Ethical Issues in the
Determination of Death



President's Commission for the Study of
Ethical Problems in Medicine and
Biomedical and Behavioral Research

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Determination of Death

July 1981

President's Commission for the Study of
Ethical Problems in Medicine and
Biomedical and Behavioral Research

President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research

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President's Commission for the Study of Ethical Problems
in Medicine and Biomedical and Behavioral Research

Suite 555, 2000 K Street, NW., Washington, DC 20006 (202) 653-8051

July 9, 1981

The Honorable Thomas P. O'Neill, Jr.
Speaker
U.S. House of Representatives
Washington, D.C. 20515

Dear Mr. Speaker:

On behalf of the President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research, I am pleased to transmit our report concerning the "definition" of death. This is one of several subjects which Public Law 95-622 directs the Commission to study and regarding which we are to report to the President, the Congress and the relevant Departments of government.

We have concluded that, in light of the ever increasing powers of biomedical science and practice, a statute is needed to provide a clear and socially-accepted basis for making determinations of death. We recommend the adoption of such a statute by the Congress for areas coming under federal jurisdiction and by all states as a means of achieving uniform law on this subject throughout the Nation.

We are grateful for the opportunity to assist in resolving this issue of public concern and importance.

Respectfully,

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Morris B. Abram
Chairman



President's Commission for the Study of Ethical Problems
in Medicine and Biomedical and Behavioral Research

Suite 555. 2000 K Street, N.W., Washington, DC 20006 (202) 653-8051

July 9, 1981

The Honorable George Bush
President
United States Senate
Washington, D.C.
20510

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President's Commission for the Study of Ethical Problems in
Medicine and Biomedical and Behavioral Research
Suite 555, 2000 K Street, N.W., Washington, DC 20006 (202) 653-8051

July 9, 1981

The President
The White House
Washington, D.C. 20500

Dear Mr. President:

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Summary of Conclusions and Recommended Statute

The enabling legislation for the President's Commission directs it to study "the ethical and legal implications of the matter of defining death, including the advisability of developing a uniform definition of death."¹ In performing its mandate, the Commission has reached conclusions on a series of questions which are the subject of this Report. In summary, the central conclusions are:

1. That recent developments in medical treatment necessitate a restatement of the standards traditionally recognized for determining that death has occurred.
2. That such a restatement ought preferably to be a matter of statutory law.
3. That such a statute ought to remain a matter for state law, with federal action at this time being limited to areas under current federal jurisdiction.
4. That the statutory law ought to be uniform among the several states.
5. That the "definition" contained in the statute ought to address general physiological standards rather than medical criteria and tests, which will change with advances in biomedical knowledge and refinements in technique.
6. That death is a unitary phenomenon which can be accurately demonstrated either on the traditional grounds of irreversible cessation of heart and lung functions or on the basis of irreversible loss of all functions of the entire brain.
7. That any statutory "definition" should be kept separate and distinct from provisions governing the donation of cadaver organs and from any legal rules on decisions to terminate life-sustaining treatment.

¹ 142 D.S.C. §1802 (1978).

To embody these conclusions in statutory form the Commission worked with the three organizations which had proposed model legislation on the subject, the American Bar Association, the American Medical Association, and the National Conference of Commissioners on Uniform State Laws. These groups have now endorsed the following statute, in place of their previous proposals:

Uniform Determination of Death Act

An individual who has sustained either (1) irreversible cessation of circulatory and respiratory functions, or (2) irreversible cessation of all functions of the entire brain, including the brain stem, is dead. A determination of death must be made in accordance with accepted medical standards.

The Commission recommends the adoption of this statute in all jurisdictions in the United States.

Introduction

Death is the one great certainty. The subject of powerful social and religious rituals and moving literature, it is contemplated by philosophers, probed by biologists, and combatted by physicians. Death, taboo in some cultures, preoccupies others. In this Report the President's Commission explores only a small corner of this boundless topic.

The question addressed here is not inherently difficult or complicated. Simply, it is whether the law ought to recognize new means for establishing that the death of a human being has occurred. The accepted standard for determining death has been the permanent absence of respiration and circulation. A question arises about continued reliance on the traditional standard because advances in medical technique now permit physicians to generate breathing and heartbeat when the capacity to breathe spontaneously has been irretrievably lost. Prior to the advent of current technology, breathing ceased and death was obvious. Now, however, certain organic processes in these bodies can be maintained through artificial means, although they will never recover the capacity for spontaneous breathing or sustained integration of bodily functions, for consciousness, or for other human experiences.

Such artificially-maintained bodies present a new category for the law (and for society), to which the application of traditional means for determining death is neither clear nor fully satisfactory. The Commission's mandate is to study and recommend ways in which the traditional legal standards can be updated in order to provide clear and principled guidance for determining whether such bodies are alive or dead.

Although it is in most respects straightforward, "the matter of defining death" seemed troublesome enough to be included in the Commission's statutory mandate for several

reasons. Most important, consideration of the new approaches to the determination of death has resulted in attention being paid to underlying questions about the meaning of life and death. Concerns about diagnosing death by measuring the presence or absence of brain functions has occasioned a reexamination of the traditional techniques. Consequently, questions have been posed about the scientific and clinical bases for the traditional standard for death and about the understanding of human life upon which that standard rests.

Furthermore, other changes in medical abilities have contributed to the concern about the "definition" of death. For example, the importance customarily accorded to a person's beating heart in differentiating the living from the dead is challenged when a "dead" person's heart can beat in the chest of a "living" person whose own heart has not merely stopped but has been removed from his or her body.

Finally, confusion arises—which can only be dispelled by the application of accepted medical standards in each individual case—because the same technology not only keeps heart and lungs functioning in some who have irretrievably lost all brain functions but also sustains other, less severely injured patients. Inexact medical and legal descriptions of these two categories of cases have led to a blurring of the important distinction between patients who are dead and those who are or may be *dying*. This Report on "Defining Death" does *not* address the medical, legal and ethical problems concerning dying patients. Issues in the treatment of dying patients will be the subject of a later study by the Commission. This Report focuses solely on the determination that death has occurred.

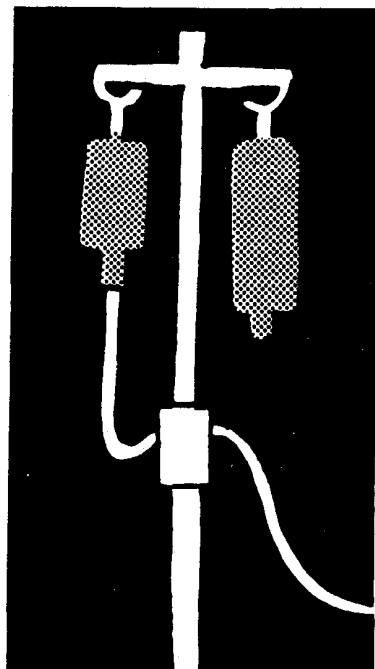
Although it is possible—indeed, in the Commission's view, necessary—to treat "determination of death" and "allowing to die" separately as matters for public policy, both arise from common roots in society. These roots not only grow in the soil of newly developed medical capabilities but are also nourished by the flood of popular attention to "death and dying." The "movement" that they have generated is now a staple of the popular media.¹ The portrayals in news stories, dramas and documentaries of vignettes and dilemmas about dying touch deep ethical and existential chords and reflect broader concerns about the physician-patient relationship, personal autonomy and control of treatment, and the myriad consequences of modern,

¹ George Gerbner, "Death in Prime Time: Notes on the Symbolic Functions of Dying in the Mass Media," 447 *Ann. Am. Acad. Polito & Soc. Sci.* 64 (1980); Michel Vovelle, "Rediscovery of Death Since 1960," 447 *Ann. Am. Acad. Polito & Soc. Sci.* 89 (1980).

high-technology medicine. All of these areas are matters for continuing study by the Commission, illuminated by, but not limited to, the special setting of death and dying.

Overview of the Report

Traditionally, the cessation of heartbeat and of breathing were regarded by the lay and medical communities alike as the definitive signs of death. The law, through the judgments of courts in deciding individual cases, articulated this general view. In the oft-quoted words of *Black's Law Dictionary*, the common law mirrored the physician's "definition" of death "as a total stoppage of the circulation of the blood, and a cessation of the animal and vital functions consequent thereon, such as respiration, pulsation, etc."¹



Developments in medical technology and practice, which are reviewed in Chapter One, have prompted an examination of the adequacy of the traditional view of the proper way to determine whether death has occurred. Since respiration is controlled by brain centers, the loss of function in those centers used to mean that breathing (and consequently heartbeat) would never return. Mechanical respirators and related therapy now enable physicians to reverse the failure of respiration and circulation in many victims of conditions such as cardiac arrest or trauma. If blood flow to the

brain is restored quickly enough (usually this must be within several minutes), these victims may eventually recover unassisted breathing. But the brain cannot regenerate neural cells to replace ones that have permanently stopped metabolizing. Hence, longer periods without blood flow (ischemia) or oxygen (anoxia) may cause complete and irreversible loss of all brain functions. When the entire brain

¹ *Black's Law Dictionary*, (4th ed.) West Publishing Co., St. Paul, Minn. (1968) at 488: DEATH. The cessation of life; the ceasing to exist; defined by physicians as a total stoppage of the circulation of the blood, and a cessation of the animal and vital functions consequent thereon, such as respiration, pulsation, etc.

But see Black's Law Dictionary (5th ed.) West Publishing Co., St. Paul, Minn. (1979) at 170, which now includes an entry under the heading "brain death," citing recent statutes and court cases.

has been so severely damaged, spontaneous respiration can never return even though breathing may be maintained by artificial means for some time (typically, several days).

Although physicians find themselves unable to rely on respiration and circulation as a means of diagnosing death in artificially-maintained, comatose patients, they have developed means of detecting the existence or nonexistence of brain functions and the potential for reversibility in such patients. These tests are intended to measure the organic functioning of the brain, not the mere existence of cellular activity which may continue in some brain cells-as in cells of other organs, such as the heart and lungs-for varying lengths of time after the organ has lost the ability to fulfill any of its functions in an organized manner. From the evidence presented at the Commission's July 11, 1980, meeting and in the biomedical literature, the Commission concludes in Chapter Two that proof of an irreversible absence of functions in the entire brain, including the brainstem, provides a highly reliable means of declaring death for respirator-maintained bodies.

The diagnosis of death has, of course, significance beyond its role as a physiological concept. Therefore in Chapter Three several different explanations of the "meaning" of human life and death are examined. Formulations based upon the functions of the whole brain include those that focus on the integrated functioning of brain, heart and lung and on the primacy of the brain among organs as the body's regulator. Some people have argued for a "higher brain" formulation, such as one which attempts to enumerate the characteristics essential to "personhood" or one that bases death on the loss of "personal identity," viewed here as a consequence of discontinuity in certain mental processes. Finally, several explanations of death not oriented to brain functions are also reviewed, such as those which hold death to occur when the soul leaves the body or which equate life with the flow of air and blood through the body. The Commission had some points of disagreement with all of the formulations. Nevertheless, without resolving all the conceptual issues, the Commission found that all the formulations, except perhaps the last, were consistent with the public policy recommendations of this Report.

If death were entirely a medical matter, the process of "redefinition" might have been left in the hands of the health professions, as the Commission notes in Chapter Four. But, as the Congress and the President signified in referring this task to an interdisciplinary, broadly-based public body for study, the standards by which death is determined have significance and consequences that are not limited to medical ones. Accordingly, the standards by

which death is to be recognized should be arrived at publicly, although it will remain for physicians to continue to develop criteria and tests and to apply them in reaching individual diagnoses.

Chapter Four examines ways to effect this public response. Traditionally, the law on the determination of death was found in the common law decisions of judges ruling on individual cases rather than in the statute books.¹ One could, of course, remain in that tradition and await judicial reformulation of the standard. Yet this method of law reform has serious drawbacks-among them, delay, uncertainty, and lack of consistency in the rules applicable in different jurisdictions. Consequently, in the past decade half the states have adopted statutes incorporating the cessation of total brain functions as a ground for declaring death.

Having concluded that change should be effected publicly and through legislation, the Commission next addresses several basic policy issues. First, how specific- socially or scientifically-should this legislation be? After considering the alternatives, from the basic concept of death to the precise clinical procedures for diagnosis, the Commission concludes that what is required is the promulgation of general physiologic standards for recognizing that death has occurred.

Second, a statute ought to meet several objectives. Most important, any law should treat like cases alike and provide consistency among jurisdictions when an issue is as important as determining that a human being has died. As a practical matter, alternative standards may be necessary and appropriate. But the use of two standards in a statute should not be permitted to obscure the fact that death is a unitary phenomenon.

It is also desirable, in the Commission's view, to limit change in the law on death to the minimum necessary for the problem at hand, i.e., ambiguity about the status of cases of coma with respirator-assistance. Extending the "definition" of death beyond those lacking all brain functions to include, for example, persons who have lost only cognitive functions but are still able to breathe spontaneously would radically change the meaning of death. Furthermore, in language as well as content, any legislation ought to make personal sense to lay people and to reflect scientific knowledge and clinical reality.

Certainty and clarity about the standards for determining death are equally matters of concern in the making of public policy throughout the country. Practically, patients are transported across state lines for treatment; if neighboring states had different definitions, confusion would proba-

¹See Appendix D, *infra*.

bly result, and abuse become possible. State-by-state variation is not justified on a matter that is so fundamental and that rests on biological facts of universal applicability. Accordingly, in Chapter Five, the Commission recommends that all states adopt a uniform statute on determining death to replace existing judicial or statutory formulations. Expecting that uniform law will emerge from this process, the Commission concludes that this topic remains an appropriate subject for state rather than federal legislation, except as to those areas where the federal government exercises jurisdiction. The chapter also provides a point-by-point examination of the proposed statute and the reasons favoring its adoption.

Finally, Chapter Five concludes with brief comments on several ethical aspects of the proposed statute. The purpose in changing the law is to regularize its administration and to permit more prudent and humane medical care. These improvements will better protect life and respect the fact of its end. Plainly, any standard for determining death must be capable of certain and consistent application.

The Process of the Commission's Study

At its first meeting, in January 1980, the Commission decided to make the "matter of defining death" one of its first studies. Discussion centered on four points: (1) whether a federal commission is an appropriate body to formulate a position regarding a matter traditionally left to state law, (2) whether problems of uniformity or implementation had arisen with the statutes on death already adopted by many States, (3) whether one or more of the existing "model statutes" should be endorsed or a new one proposed, and (4) whether to enlarge on the Commission's statutory mandate to study with the "definition of death" the related but distinct issues presented by decisions to forego life-sustaining therapy.

At its next meeting, in May, the Commission heard philosophical and political testimony on the determination of death. Professor Daniel Wikler, a University of Wisconsin philosopher, proposed a concept of "personal identity" to supplant the common understanding of "whole brain" functioning as the basis for "brain death." Nevertheless, he urged the Commissioners to focus on the legal issue of whether those who are "brain dead" should be ruled legally dead. He noted that it may be possible to agree on policy without achieving full consensus on the purely conceptual issues. Professor Wikler's points are considered in Chapter Three.

Professor Robert Veatch of the Kennedy Institute of Ethics at Georgetown University cautioned against using the term "brain death" because it has two distinct but

confusing meanings—cessation of brain functions and the death of a person based on that cessation. He noted that the latter phenomenon is the one of concern to public policy. Two basic issues identified by Professor Veatch are considered in this Report: (1) Should society stay with heart-lung criteria for death, since some people still doubt that a person is dead while a respirator keeps lungs and heart working, or, at the other extreme, should death be based solely on the loss of "higher" brain functions? and (2) Is diversity in the public definition of death (by society, physicians, patients, or their agents) possible? Can such diversity be tolerated on so fundamental a matter?

During May the Commission's Executive Director met with representatives of the American Bar Association (ABA), the American Medical Association (AMA), and the National Conference of Commissioners on Uniform State Laws (NCCUSL). Those attending this meeting prepared a statute on the determination of death which they recommended for approval by their organizations in place of the organizations' preexisting statutory proposals. During the summer, the Director served as a special consultant to the NCCUSL during its deliberations about the proposed statute, which was approved. Subsequently, the new uniform statute was also approved by the AMA (October 19, 1980) and the ABA (February 10, 1981).



The Commission devoted a day of testimony and discussion to the medical and theological aspects of "defining" death at its next meeting, in July 1980. During the morning, the Commission heard from five expert witnesses: Dr. Frank Veith, Chief of Vascular Surgery at the Montefiore Hospital in New York City; Dr. Ronald Cranford,

Director of the Neurological Intensive Care Unit at the Hennepin County Medical Center, and Chairman of the Ethics Committee of the American Academy of Neurology; Dr. Gaetano Molinari, Professor and Chairman of the Department of Neurology at the School of Medicine and Health Services at George Washington University, who had served as the principal NIH officer for the Collaborative Study of Cerebral Death; Dr. Earl Walker, Adjunct Professor Neurosurgery and Neurology at the University of New Mexico School of Medicine, Coordinator of the Collaborative Study; and Dr. Julius Korein, Professor of Neurology at the New York University Medical Center.

The witnesses agreed that the technological advances which have made artificial respiration possible also spawned criteria for determining irreversible cessation of brain functions. The physicians all concurred that a statutory definition of death should encompass irreversible loss of brain functions. They cited a number of reasons:

- (1) Such a law would establish the legality of pronouncing death based on brain criteria;
- (2) The use of the brain-based standard when the heart-lung standard is not applicable would protect patients against ill-advised, idiosyncratic pronouncements of death;
- (3) Legal recognition of the brain-based standard would remove the doubt that exists in some states over the use of patients without brain functions as organ donors;
- (4) A single set of standards for death pronouncements is appropriate for all legal purposes (encompassing inheritance, taxes and criminal trials, as well as medical treatment); and
- (5) Maintaining a dead body on artificial support systems consumes scarce medical resources and may unnecessarily deplete the family's emotional and financial resources.

Because the medical testimony indicated that the epidemiology of total and irreversible brain cessation (including the frequency of its occurrence, its effects on the medical management decisions, and the relative proportion of survivals and death among comatose patients placed on respirators) was not well documented, the Commission embarked during the Fall of 1980 on a small empirical study. A full description of this project is in Appendix B; some of its findings are highlighted in relevant sections of the Report.

The Commission also considered religious viewpoints. Testimony was received from Rabbi J. David Bleich, Associate Professor of Talmudic and Jewish Law at Yeshiva University in Union of Orthodox Jewish Congre-

gations of America; Rabbi Moses Tendler, Professor of Biology and of Talmudic Law at Yeshiva University; Father Paul M. Quay, Associate Professor in the Departments of Theological Studies and Physics at St. Louis University; Father Kevin O'Rourke, Director of the Center for Health Care Ethics at St. Louis University; and Professor Paul Ramsey, a leading Protestant theologian who is the Harrington Spear Paine Professor of Religion at Princeton University.

Jewish writings do not deal directly with "brain death" but contain passages susceptible to opposing readings. Rabbi Bleich interpreted Jewish law to require a cessation of corporal blood flow, whether or not spontaneous, as a prerequisite for determining death; Rabbi Tendler said that the Jewish tradition would recognize complete cessation of brain function as "physiological decapitation" and hence accept it as a basis for declaring death.

Catholic and Protestant theological doctrines do not directly address the method of determining death. The belief that the human essence or soul departs at the moment of death is not inconsistent with the establishment, through neurological examination, of the time when death occurs.¹ The religious concern is, rather, with according proper respect to the deceased (which may include the termination of unnecessary procedures) while also avoiding premature termination of helpful treatment under the guise of declaring death.

The views of leaders in the "right to life" movement were also reviewed. In their published statements there is support for the enactment of statutes incorporating "total brain death" as a basis for determining death. As stated by Dennis Horan, President of American Citizens United for Life,

Legislation limiting the concept of brain death to the irreversible cessation of total function of the brain, including the brain stem, is beneficial and does not undermine any of the values we seek to support.²

Indeed, by drawing a clear line between the living and the dead, legislation of this sort is supported as a means of relieving "some of the pressure for legalizing euthanasia"³ according to a leading pro-life philosopher, Christian Eth-

¹ "[I]t remains for the doctor to give a clear and precise definition of 'death' and the 'moment of death' of a patient who passes way in the state of unconsciousness." Pope Pius XII, "The Prolongation of Life," 4 *The Pope Speaks* 393, 396 (1957).

² Dennis J. Horan, "Definition of Death: An Emerging Consensus," 16 *Trial* 22,26 (1980). See also pp. 81-84 *infra*.

³ "[A] correct definition of death, if it would eliminate some false classifications of dead individuals [as being] among the living, could relieve some of the pressure for legalizing euthanasia-in this case, pressure arising from a right attitude toward individuals really dead and only considered alive due to conceptual confusion." Germain Grisez & Joseph M. Boyle, Jr., *Life and Death with Liberty and Justice: A Contribution to the Euthanasia Debate*, University of Notre Dame Press, Notre Dame, Indiana (1979) at 61. Dennis Horan also concludes that "total brain death legislation enhances those values [we seek to support] by prohibiting euthanasia and allowing only those to be declared dead who are really dead." *Gp. cit.* at 26.

ics Professor Germain Grisez of Mount Saint Mary's College.

The theological witnesses stated that it is neither necessary nor appropriate for public policy to resolve matters of religious belief. The Commission agrees; the statute recommended in this Report rests on secular foundations and does not purport to dictate religious beliefs. Necessarily, however, in reforming the legal standards governing a physician's determination that someone's biological life has ended, the proposed statute will have implications for secular legal and medical conduct with respect to the dead, while permitting accommodation of religious views and practices.¹

Testimony from several of the religious leaders emphasized that death is an absolute phenomenon, so that terms such as "brain dead" or "virtually dead" are misleading. Father Quay and Professor Ramsey, in particular, warned that a statutory definition should not be construed as inviting premature organ transplantation. The Commissioners agree that since the determination of death is irrevocable, extreme caution must be exercised in the process of making public policy and law as well as each individual diagnosis. The medical information reviewed in Chapter Two of this Report and the guidelines for diagnosis developed concurrently by a group of medical experts (see Appendix F) respond to the concern for certainty.

The staff's first draft report was briefly considered at the September 1980 meeting. A second draft was discussed at the November meeting, at which time the Commissioners endorsed the general presentation and the model statute. Following that meeting, the draft Report was revised and circulated. The Commissioners discussed that revised draft at their June 1981 meeting. Final consideration of the subject occurred at the meeting of July 9, 1981, at which time the Commissioners present unanimously gave formal approval to the Uniform Determination of Death Act and to this Report, subject to several editorial corrections.

¹ See pp. 80-81 *infra*.

Why "Update" Death?

1

For most of the past several centuries, the medical determination of death was very close to the popular one. If a person fell unconscious or was found so, someone (often but not always a physician) would feel for the pulse, listen for breathing, hold a mirror before the nose to test for condensation, and look to see if the pupils were fixed. Although these criteria have been used to determine death since antiquity, they have not always been universally accepted.

Developing Confidence in the Heart-Lung Criteria

In the eighteenth century, macabre tales of "corpses" reviving during funerals and exhumed skeletons found to have clawed at coffin lids led to widespread fear of premature burial. Coffins were developed with elaborate escape mechanisms and speaking tubes to the world above (Figure 1), mortuaries employed guards to monitor the newly dead for signs of life, and legislatures passed laws requiring a delay before burial.¹

The medical press also paid a great deal of attention to the matter. In *The Uncertainty of the Signs of Death and the Danger of Precipitate Interments* in 1740, Jean-Jacques Winslow advanced the thesis that putrefaction was the only sure sign of death. In the years following, many physicians published articles agreeing with him. This position had, however, notable logistic and public health disadvantages. It also disparaged, sometimes with unfair vigor, the skills of physicians as diagnosticians of death. In reply, the French surgeon Louis published in 1752 his influential *Letters on*

¹ Marc Alexander, "The Rigid Embrace of the Narrow House: Premature Burial and the Signs of Death," 10 *Hastings Ctr. Rpt.* 25 (1980); John D. Arnold, Thomas F. Zimmerman and Daniel C. Martin, "Public Attitudes and the Diagnosis of Death," 206 *I.A.M.A.* 1949 (1968).

the Certainty of the Signs of Death. The debate dissipated in the nineteenth century because of the gradual improvement in the competence of physicians and a concomitant increase in the public's confidence in them.

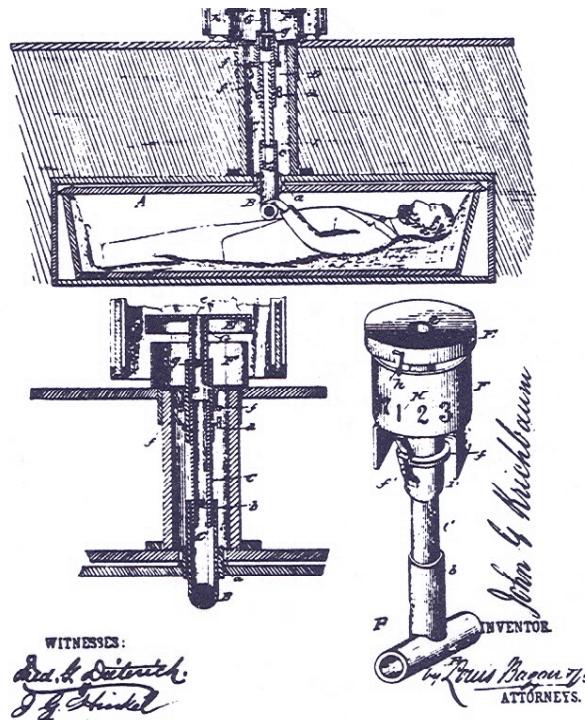


Figure 1. Kirchbaum's device for indicating life in buried persons, Patent sketch, 1882.

Physicians actively sought to develop this competence. They even held contests encouraging the search for a cluster of signs—rather than a single infallible sign—for the diagnosis of death.¹ One sign did, however, achieve prominence. The invention of the stethoscope in the mid-nineteenth century enabled physicians to detect heartbeat

¹ Alexander, op. cit. at 30, citing, Orfila, *A Popular Treatise on the Remedies to be Employed in Case of Poisoning and Apparent Death; Including Means of Detecting Poisons, of Distinguishing Real From Apparent Death, and of Ascertaining the Adulteration of Wines*, trans. from French, Philadelphia, (1818) at 154; G. Tourdes, "Mort (Medicine legate)," *Dictionnaire Encyclopedique des Sciences Medicales*, Ser. II, X (1875) at 579-708, 603.

with heightened sensitivity. The use of this instrument by a well-trained physician, together with other clinical measures, laid to rest public fears of premature burial. The twentieth century brought even more sophisticated technological means to determine death, particularly the electrocardiograph (EKG), which is more sensitive than the stethoscope in detecting cardiac functioning.

The Interrelationships of Brain, Heart, and Lung Functions

The brain has three general anatomic divisions: the cerebrum, with its outer shell called the cortex; the cerebellum; and the brainstem, composed of the midbrain, the pons, and the medulla oblongata (Figure 2). Traditionally, the cerebrum has been referred to as the "higher brain" because it has primary control of consciousness, thought, memory and feeling. The brainstem has been called the "lower brain," since it controls spontaneous, vegetative functions such as swallowing, yawning and sleep-wake cycles. It is important to note that these generalizations are not entirely accurate. Neuroscientists generally agree that such "higher brain" functions as cognition or consciousness probably are not mediated strictly by the cerebral cortex; rather, they probably result from complex interrelations between brainstem and cortex.

Respiration is controlled in the brainstem, particularly the medulla (Figure 2). Neural impulses originating in the respiratory centers of the medulla stimulate the diaphragm and intercostal muscles, which cause the lungs to fill with air. Ordinarily, these respiratory centers adjust the rate of breathing to maintain the correct levels of carbon dioxide and oxygen. In certain circumstances, such as heavy exercise, sighing, coughing or sneezing, other areas of the brain modulate the activities of the respiratory centers or even briefly take direct control of respiration.

Destruction of the brain's respiratory center stops respiration, which in turn deprives the heart of needed oxygen, causing it too to cease functioning. The traditional signs of life-respiration and heartbeat-disappear: the person is dead. The "vital signs" traditionally used in diagnosing death thus reflect the direct interdependence of respiration, circulation and the brain.

The artificial respirator and concomitant life-support systems have changed this simple picture. Normally, respiration ceases when the functions of the diaphragm and intercostal muscles are impaired. This results from direct injury to the muscles or (more commonly) because the neural impulses between the brain and these muscles are interrupted. However, an artificial respirator (also called a ventilator) can be used to compensate for the inability of the thoracic muscles to fill the lungs with air. Some of these

machines use negative pressure to expand the chest wall (in which case they are called "iron lungs"); others use positive pressure to push air into the lungs. The respirators are equipped with devices to regulate the rate and depth of "breathing," which are normally controlled by the respiratory centers in the medulla. The machines cannot compensate entirely for the defective neural connections since they cannot regulate blood gas levels precisely. But, provided that the lungs themselves have not been extensively damaged, gas exchange can continue and appropriate levels of oxygen and carbon dioxide can be maintained in the circulating blood.

Unlike the respiratory system, which depends on the neural impulses from the brain, the heart can pump blood without external control. Impulses from brain centers modulate the inherent rate and force of the heartbeat but are not required for the heart to contract at a level of function that is ordinarily adequate. Thus, when artificial respiration provides adequate oxygenation and associated medical treatments regulate essential plasma components and blood pressure, an intact heart will continue to beat, despite loss of brain functions. At present, however, no machine can take over the functions of the heart except for a very limited time and in limited circumstances (e.g., a heart-lung machine used during surgery). Therefore, when a severe injury to the heart or major blood vessels prevents the circulation of the crucial blood supply to the brain, the loss of brain functioning is inevitable because no oxygen reaches the brain.

Loss of Various Brain Functions

The most frequent causes of irreversible loss of functions of the whole brain are: (1) direct trauma to the head, such as from a motor vehicle accident or a gunshot wound, (2) massive spontaneous hemorrhage into the brain as a result of ruptured aneurysm or complications of high blood pressure, and (3) anoxic damage from cardiac or respiratory arrest or severely reduced blood pressure.¹

Many of these severe injuries to the brain cause an accumulation of fluid and swelling in the brain tissue, a condition called cerebral edema. In severe cases of edema, the pressure within the closed cavity increases until it exceeds the systolic blood pressure, resulting in a total loss of blood flow to both the upper and lower portions of the brain. If deprived of blood flow for at least 10-15 minutes, the brain, including the brainstem, will completely cease func-

¹ Ronald E. Cranford and Harmon L. Smith, "Some Critical Distinctions Between Brain Death and Persistent Vegetative State" 6 *Ethics in Sci. and Med.* 199, 201 (1979).

tioning.¹ Other pathophysiologic mechanisms also result in a progressive and, ultimately, complete cessation of intracranial circulation.

Once deprived of adequate supplies of oxygen and glucose, brain neurons will irreversibly lose all activity and ability to function. In adults, oxygen and/or glucose deprivation for more than a few minutes causes some neuron loss.² Thus, even in the absence of direct trauma and edema, brain functions can be lost if circulation to the brain is impaired. If blood flow is cut off, brain tissues completely self-digest (autolyze) over the ensuing days.

When the brain lacks all functions, consciousness is, of course, lost. While some spinal reflexes often persist in such bodies (since circulation to the spine is separate from that of the brain), all reflexes controlled by the brainstem as well as cognitive, affective and integrating functions are absent. Respiration and circulation in these bodies may be generated by a ventilator together with intensive medical management. In adults who have experienced irreversible cessation of the functions of the entire brain, this mechanically generated functioning can continue only a limited time because the heart usually stops beating within two to ten days. (An infant or small child who has lost all brain functions will typically suffer cardiac arrest within several weeks, although respiration and heartbeat can sometimes be maintained even longer.³)

Less severe injury to the brain can cause mild to profound damage to the cortex, lower cerebral structures, cerebellum, brainstem, or some combination thereof. The cerebrum, especially the cerebral cortex, is more easily injured by loss of blood flow or oxygen than is the brainstem. A 4-6 minute loss of blood flow—caused by, for example, cardiac arrest—typically damages the cerebral cortex permanently, while the relatively more resistant brainstem may continue to function.⁴

¹ H. A. H. van Till-d'Aulnis de Bourouill, "Diagnosis of Death in Comatose Patients under Resuscitation Treatment: A Critical Review of the Harvard Report," *2 Am. J. L. & Med.* 1,21-22 (1976).

² One exception to this general picture requires brief mention. Certain drugs or low body temperature (hypothermia) can place the neurons in "suspended animation." Under these conditions, the neurons may receive virtually no oxygen or glucose for a significant period of time without sustaining irreversible damage. This effect is being used to try to limit brain injury in patients by giving them barbiturates or reducing temperature; the use of such techniques will, of course, make neurological diagnoses slower or more complicated.

³ Julius Korein, "Brain Death," in J. Cottrell and H. Turndorf (eds.) *Anesthesia and Neurosurgery*, C.V. Mosby & Co., St. Louis (1980) at 282, 284, 292-293.

⁴ Cranford and Smith, *op. cit.* at 203.

When brainstem functions remain, but the major components of the cerebrum are irreversibly destroyed, the patient is in what is usually called a "persistent vegetative state" or "persistent noncognitive state."¹ Such persons may exhibit spontaneous, involuntary movements such as yawns or facial grimaces, their eyes may be open and they may be capable of breathing without assistance. Without higher brain functions, however, any apparent wakefulness does not represent awareness of self or environment (thus, the condition is often described as "awake but unaware"). The case of Karen Ann Quinlan has made this condition familiar to the general public. With necessary medical and nursing care—including feeding through intravenous or nasogastric tubes, and antibiotics for recurrent pulmonary infections—such patients can survive months or years, often without a respirator. (The longest survival exceeded 37 years.²)

Conclusion: The Need for Reliable Policy

Medical interventions can often provide great benefit in avoiding *irreversible* harm to a patient's injured heart, lungs, or brain by carrying a patient through a period of acute need. These techniques have, however, thrown new light on the interrelationship of these crucial organ systems. This has created complex issues for public policy as well.

For medical and legal purposes, partial brain impairment must be distinguished from complete and irreversible loss of brain functions or "whole brain death."³ The President's Commission, as subsequent chapters explain more fully, regards the cessation of the vital functions of the entire brain—and not merely portions thereof, such as those responsible for cognitive functions—as the only proper neurologic basis for declaring death. This conclusion accords with the overwhelming consensus of medical and legal experts and the public.

Present attention to the "definition" of death is part of a process of development in social attitudes and legal rules stimulated by the unfolding of biomedical knowledge. In the nineteenth century increasing knowledge and practical skill made the public confident that death could be diagnosed reliably using cardiopulmonary criteria. The ques-

¹ Bryan Jennett and Fred Plum, "The Persistent Vegetative State: A Syndrome in Search of a Name," 1 *Lancet* 734 (1972); Fred Plum and Jerome B. Posner, *The Diagnosis of Stupor and Coma*, F. A. David Co., Philadelphia (1980 3rd. ed.) at 6-7.

² See Norris McWhirter (ed.) *The Guinness Book of World Records*, Bantam Books, New York (1981) at 42, citing the case of Elaine Esposito who lapsed into coma following surgery on August 6, 1941 and died on November 25, 1978, 37 years and 111 days later.

³ Original has footnote indicated in text, but no footnote at bottom of page.

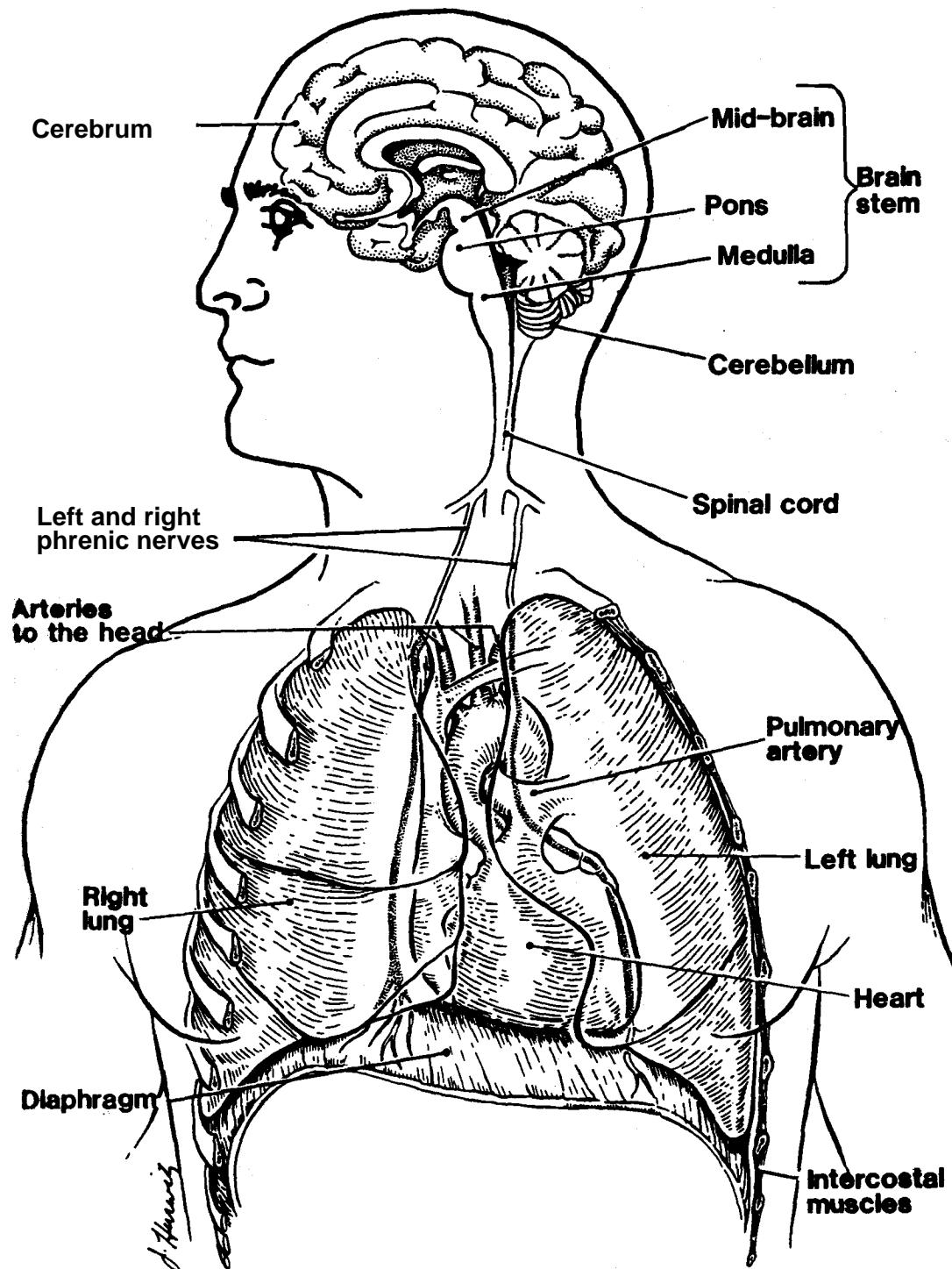


Figure 2. Anatomic Interrelationships of Heart, Lungs and Brain

tion now is whether, when medical intervention may be responsible for a patient's respiration and circulation, there are other equally reliable ways to diagnose death.

The Commission recognizes that it is often difficult to determine the severity of a patient's injuries, especially in the first few days of intensive care following a cardiac arrest, head trauma, or other similar event. Responsible public policy in this area requires that physicians be able to distinguish reliably those patients who have died from those whose injuries are less severe or are reversible. In the next chapter, medical evidence on these points is examined. Ascertaining the medical facts is only a part of the process of framing a "definition," however. Therefore, the third chapter examines concepts of death at a more basic, albeit not technical level.

The "State of the Art" in Medicine

2

Until the past few decades, comatose patients fairly rapidly either improved or died. If no other complication supervened and the patient did not improve, death followed from starvation and dehydration within days; pneumonia, apnea, or effects of the original disease typically brought on death even more quickly. Before such techniques as intravenous hydration, nasogastric feeding, bladder catheterization and respirators, no patient continued for long in deep coma.

With the aid of modern medicine, some comatose patients can be kept from a rapid death. Many, however, become permanently and totally unresponsive. In other words, their appearance resembles that of the dead as traditionally perceived: they no longer respond to their environment by sensate and intellectual activity. But their appearance also differs from that traditionally associated with the dead because mechanical support generates breathing, heartbeat, and the associated physical characteristics (e.g., warm, moist skin) of life.

The ever more sophisticated capabilities developed by biomedical practitioners during the past quarter century to support or supplant certain vital functions have thus created new problems in diagnosing death. If these diagnostic problems were the only consequence of medicine's new capabilities, those who developed and employed them might well be criticized for having opened a Pandora's Box of troubles for physicians and for society. But, as witnesses told the Commission, in a portion of the cases the armamentarium of resuscitative medicine brings comatose patients back from the brink of death by supporting their breathing and blood flow during a period of acute need.

Since the witnesses and existing medical literature lacked information on the relative proportion of comatose,

respirator-assisted patients who survive versus those who die (as determined by either brain-based or heart/lung-based tests), the Commission sponsored a small study. This study was not intended to generate definitive data on the incidence of such outcomes but rather to provide a rough estimate of the extent of the various outcomes. The study examined the experience over a period ranging from two months to one year at seven hospitals serving major metropolitan areas. (A full description of the study and its results appears in Appendix B.) At the four acute care centers from which such data were available, 2-4 cases of irreversible loss of all brain functions arose each month, a figure consistent with other data.¹ These figures convey a useful, if limited, perspective on the frequency with which the medicolegal dilemma of determining death in comatose, respirator-assisted cases arises at such hospitals.

The social and legal as well as medical consequences attached to a determination of death make it imperative that the diagnosis be incontrovertible. One must be certain that the functions of the entire brain are irreversibly lost and that respiration and circulation are, therefore, solely artifacts of mechanical intervention. Indeed, though suspicious that their interventions may be doing nothing more than masking what would otherwise manifestly be death by the traditional measures, physicians are concerned about doing anything—such as removing a respirator—that would hinder the recovery of a patient whose loss of brain functioning might be only partial or reversible.²

Development of the Concept of "Brain Death"

The concept of "brain death" and efforts to refine criteria to identify that condition have been developing during the last two decades, concomitant with the spread of life support systems in clinical medicine. In 1959, several French neurophysiologists published results of research they had conducted on patients in extremely deep coma receiving respirator assistance, a condition they termed "coma dépassé."³ Multiple tests showed these patients

¹ Ake Grenvik, David J. Powner, James V. Snyder, Michael S. Jastremski, Ralph A. Babcock and Michael G. Loughhead, "Cessation of Therapy in Terminal Illness and Brain Death," 6 *Critical Care Med.* 284 (1978).

² Accordingly, in the procedures for diagnosing death set forth by the Commission's medical consultants in Appendix F infra, the test for apnea involves elevating the level of circulating oxygen before turning off the respirator and allowing the level of carbon dioxide to rise as a stimulus for spontaneous respiration. The high level of oxygen protects the brain cells (if any remain active) from further damage.

³ P. Mollaret and M. Goulon, "Le Coma Depasse," 101 *Rev. Neural.* 3(1959).

lacked reflexes and electrophysiologic activity. The investigators concluded that the patients had suffered permanent loss of brain functions—they were, in other words, "beyond coma." Postmortem examinations of those patients revealed extensive destruction (necrosis and autolysis) of the brain—a phenomenon that has since been called the "respirator brain."¹

With the advent of transplant surgery employing cadaver donors—first with kidney transplantation in the 1950's and later, and still more dramatically, with heart transplantation in the 1960's—interest in "brain death" took on a new urgency.² For such transplants to be successful, a viable, intact organ is needed. The suitability of organs for transplantation diminishes rapidly once the donor's respiration and circulation stop. The most desirable organ donors are otherwise healthy individuals who have died following traumatic head injuries and whose breathing and blood flow are being artificially maintained. Yet even with proper care, the organs of these potential donors will deteriorate. Thus, it became important for physicians to be able to determine when the brains of mechanically-supported patients irretrievably ceased functioning.

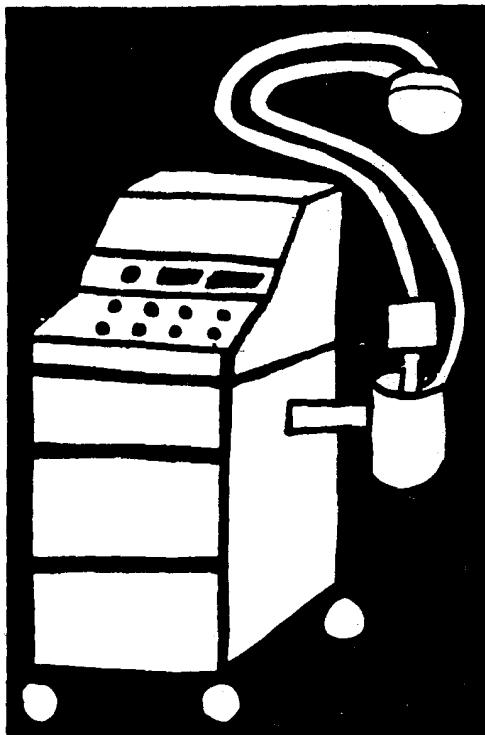
Yet, the need for viable organs to transplant does not account fully for the interest in diagnosing irreversible loss of brain functions. The Commission's study illustrates this point; of 36 comatose patients who were declared dead on the basis of irreversible loss of brain functions, only six were organ donors. Other studies also report that organs are procured in only a small percentage of cases in which brain-based criteria might be applied.³ Thus, medical con-

¹ A. Earl Walker, E. L. Diamond and John Moseley, "The Neuropathological Findings in Irreversible Coma; A Critique of the Respirator Brain," 34 *J. Neuropath. Exp. Neurol.* 295 (1975); John I. Moseley, Gaetano F. Molinari and A. Earl Walker, "Respirator Brain: Report of a Survey and Review of Current Concepts," 100 *Arch. Pathol. Lab. Med.* 61 (1976).

² See, e.g., Renée C. Fox and Judith P. Swazey, *The Courage to Fail: A Social View of Organ Transplantation and Dialysis*, University of Chicago Press, Chicago, (1978); Francis D. Moore, *Give and Take: The Biology of Tissue Transplantation*, W.B. Sanders, Co., Philadelphia, Pa. (1964).

³ See e.g., Howard H. Kaufman, John D. Hutchton, Megan M. McBride, Carolyn A. Beardsley and Barry D. Kahan, "Kidney Donation: Needs and Possibilities," 5 *Neurosurg.* 237 (1979); K. J. Bart, "The Prevalance of Cadaveric Organs for Transplantation" in S.W. Sell, U.P. Perry and M.M. Vincent (eds.) *Proceedings of the 1977 Annual Meeting of American Association Tissue Banks*, American Association of Tissue Banks., Rockville, Md. (1977) at 124-130; A. Earl Walker, "The Neurosurgeon's Responsibility for Organ Procurement," 44 *J. Neurosurg.* 1 (1976).

cern over the determination of death rests much less with any wish 'to facilitate organ transplantation than with the



the need both to render appropriate care to patients and to replace artificial support with more fitting and respectful behavior when a patient has become a dead body. Another incentive to update the criteria for determining death stems from the increasing realization that the dedication of scarce and expensive intensive care facilities to bodies without brain functions may not only prolong the uncertainty and suffering of grieving families but also preclude access to the facilities for patients with reversible conditions.¹

The Emergence of a Medical Consensus

Medical concern over making the proper diagnosis in respirator-supported patients led to the development of criteria which reliably establish permanent loss of brain functions. A landmark in this process was the publication in 1968 of a report by an ad hoc committee of the Harvard Medical School which became known as the "Harvard criteria."² The Committee's report described the following characteristics of a permanently nonfunctioning brain, a condition it referred to as "irreversible coma":

¹ B.D. Colen, "Medical Examiner's Solution to Life and Death Problem," January 28, 1978, *Wash Post* §A at 8, col. 1, describing the attempts of Dr. Ron Wright, deputy chief medical examiner for Dade County Florida, to have medical interventions ceased for bodies declared dead on the basis of brain-oriented criteria. (Florida did not enact a statute on the subject until 1980.) "Wright was able to get a judge to hold a special Sunday morning hearing at the hospital-with reporters and photographers in attendance-at which he successfully argued that the family was being forced to pay \$2,000 a day to keep a dead body in the intensive care unit." Patricia H. Butcher, "Management of the Relatives of Patients with Brain Death" in Ronald V. Trubuhovich (ed). *Management of Acute Intracranial Disasters*, Little, Brown and Company, Boston, Mass. (1979) at 327.

² Ad Hoc Committee of the Harvard Medical School to Examine the Definition of Brain Death, "A Definition of Irreversible Coma," 205 *J.A.M.A.* 337 (1968).

1. *Unreceptivity and unresponsitivity.* The patient shows a total unawareness to externally applied stimuli and inner need, and complete unresponsiveness, even when intensely painful stimuli are applied.

2. *No movements or breathing.* All spontaneous muscular movement, spontaneous respiration, and response to stimuli such as pain, touch, sound or light are absent.

3. *No reflexes.* Among the indications of absent reflexes are: fixed, dilated, pupils; lack of eye movement even when the head is turned or ice water is placed in the ear; lack of response to noxious stimuli; and generally, unelicitable tendon reflexes.

In addition to these three criteria, a flat electroencephalogram (EEG), which shows that there is no discernible electrical activity in the cerebral cortex, was recommended as a confirmatory test, when available. All tests were to be repeated at least 24 hours later without showing change. Drug intoxication (e.g., barbiturates) and hypothermia (body temperature below 90°F), which can cause a reversible loss of brain functions, also had to be excluded before the criteria could be used.

The "Harvard criteria" have been found to be quite reliable. Indeed, no case has yet been found that met these criteria and regained any brain functions despite continuation of respirator support. Criticisms of the criteria have been of five kinds. First, the phrase "irreversible coma" is misleading as applied to the cases at hand. "Coma" is a condition of a living person, and a body without any brain functions is dead and thus beyond any coma. Second, the writers of these criteria did not realize that the spinal cord reflexes actually persist or return quite commonly after the brain has completely and permanently ceased functioning. Third, "unreceptivity" is not amenable to testing in an unresponsive body without consciousness. Next, the need adequately to test brainstem reflexes, especially apnea, and to exclude drug and metabolic intoxication as possible causes of the coma, are not made sufficiently explicit and precise. Finally, although all individuals that meet "Harvard criteria" are dead (irreversible cessation of all functions of the entire brain), there are many other individuals who are dead but do not maintain circulation long enough to have a 24-hour observation period. Various other criteria have been proposed since 1968 that attempt to ameliorate these deficiencies.¹

¹ David J. Pawner, James V. Snyder, and Ake Grenvik, "Brain Death Certification: A Review," 5 *Crit. Care Med.* 230 (1977); Julius Korein, "Brain Death," in J. Cottrell and H. Turndorf (eds.) *Anesthesia and Neurosurgery* (1980) at 282; Peter McL. Black, "Brain Death" 299 *N.E.J.M.* 338 & 393 (1978).

As the Harvard Committee noted, permanent loss of brain functions can also be confirmed by absence of circulation to the brain. The brain necessarily ceases functioning after a short period without intracranial circulation, unless it is protected by hypothermia or drug induced depression of neuronal metabolism. In recent years, several procedures have been developed to test for absence of intracranial blood flow, including radioisotope cerebral angiography by bolus or static imaging and four vessel intracranial contrast angiography.¹

Clinical research has emphasized the development of procedures that can be performed reliably at a patient's bedside, so as to interfere as little as possible with treatment and not to risk harming the patient when recovery may still be possible. The aim of the tests is to reduce mistaken diagnoses that a patient is still alive, without incurring risks of erroneous diagnoses that a patient lacks all brain functioning when such functions actually remain or could recur. This is achieved by establishing first that all brain functions have ceased and then ascertaining that the cessation is irreversible. To do this, the cause of coma must be established and this may require, in addition to history and physical examination, such tests as computerized axial tomography, electroencephalography and echoencephalography.² The cause of the cessation of functions must be sufficient to explain the individual's clinical status and must be demonstrated to be permanent during a period of observation.³

¹ See, e.g., Julius Korein (ed.), *Brain Death: Interrelated Medical and Social Issues*, 315 Ann. N.Y. Acad. Sci. 62-214 (1978); Julius Korein, Phillip Braunstein, Ajax George, Melvin Wichter, Irving Kricheff, Abraham Lieberman and John Pearson, "Brain Death: I. Angiographic Correlation with the Radioisotopic Bolus Technique for Evaluation of Critical Deficit of Cerebral Blood Flow," 2 Ann. Neural. 206 (1977); Andrew J.K. Smith and A. Earl Walker, "Cerebral Blood Flow and Brain Metabolism as Indicators of Cerebral Death: A Review," 133 Johns Hopkins Med. J. 107 (1973); Julius M. Goodman and Larry I. Heck, "Confirmation of Brain Death by Bedside Isotope Angiography," 238 J.A.M.A. 966 (1977).

² See, e.g., Gian Emilio Chatrian, "Electrophysiologic Evaluation of Brain Death: A Critical Appraisal," in M. J. Aminoff (ed.) *Electrodiagnosis in Clinical Neurology*, Churchill Livingstone, New York (1980); Donald R. Bennett, Julius Korein, John R. Hughes, Jerome K. Merlis and Cary Suter, *Atlas of Electroencephalography in Coma and Cerebral Death*, Raven Press, New York (1976); Fred Plum and Jerome B. Posner, *op. cit.*; Stuart A. Schneck, "Brain Death and Prolonged State of Impaired Responsiveness," 58 Denver L. J. 609, 612-613 (1981).

³ See, e.g., U.S. Department of Health and Human Services, *The NINCDS Collaborative Study of Brain Death*, N.I.H. Publication No. 81-2286, U.S. Government Printing Office (1980), reported in, "An Appraisal of the Criteria of Cerebral Death. A Summary Statement. A Collaborative Study," 237 J.A.M.A. 982 (1977); Peter McL. Black, *op. cit.*; Pamela F. Prior, "Brain Death" 1980(i) *Lancet* 1142.

The studies that document the adequacy of criteria have followed one of two general formats. Some define a group of subjects who have met the proposed criteria and demonstrate that in all such cases the heart soon stopped beating despite intensive therapy.¹ Other studies identify a group of subjects who met the proposed criteria and demonstrate widespread brain necrosis at autopsy, providing the body has remained on a respirator for sufficient time for necrosis to occur.² All the studies focus on patients with deep coma including absence of spontaneous breathing (apnea): in addition, some require known and sufficient cause for the absence of brain functions, isoelectric electroencephalogram, dilated pupils, or absent circulation shown by angiography. The published criteria for determining cessation of brain functions have been uniformly successful in diagnosing death. The differences among criteria often arise from differing assessments of the technical skill and instrumentation available to the physician. Experts now generally agree that careful clinical assessment (including identification of a cause of the damage to the brain which is sufficient to explain the clinical findings) is the *sine qua non* of a diagnosis.

The role of confirmatory tests such as electroencephalography or circulation tests beyond such bedside judgments in establishing either the cessation of brain functions or the irreversibility of such cessation has been the subject of considerable discussion.³ For example, the Conference of Royal Colleges and Faculties in Britain focused on the function of the brainstem alone to diagnose death.⁴ Since the brainstem's reticular activating formation is essential to generating consciousness and its transmittal of motor and sensation impulses is essential to these functions, loss of brainstem functions precludes discernable functioning of the cerebral hemispheres. In addition, the brainstem is the locus of homeostatic control, cranial nerve reflexes, and control of respiration. Thus, if the brainstem

¹ See, e.g., Bryan Jennett, John Gleave and Peter Wilson, "Brain Death in Three Neurosurgical Units" 282 *Brit. Med. J.* 533 (1981).

² See, e.g., U.S. Department of Health and Human Services, The NINCDS Collaborative Study of Brain Death, *op. cit.*

³ Peter McL. Black, *op. cit.*

⁴ Conference of Royal Colleges and Faculties of the United Kingdom, "Memorandum on the Diagnosis of Death" (January 1979), in Working Party of the United Kingdom Health Departments, *The Removal of Cadaveric Organs for Transplantation: A Code of Practice* (1979) at 32-36.

completely lacks functions, the brain as a whole cannot function. American physicians, however, judge the reliability of brainstem testing to be incomplete. Therefore they endorse the appropriate use of cerebral blood flow testing or electroencephalography in order to confirm the completeness of injury and the irreversibility of conditions that have led to cessation of brain functions.¹ The published data support the reliability of both approaches.

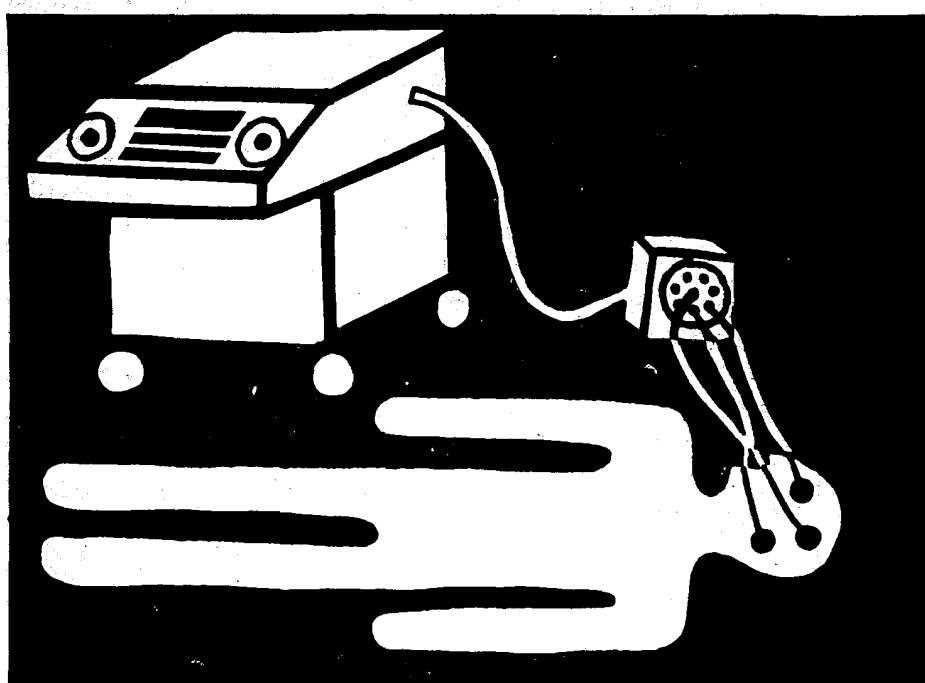
The prevailing British viewpoint on the neurologic diagnosis of death is closer to a *prognostic* approach (that a "point of no return"² has been reached in the process of dying), while the American approach is more *diagnostic* in seeking to determine that all functions of the brain have irreversibly ceased at the time of the declaration of death. Also, the British diagnose brain death almost entirely where irremediable structural injury has occurred while the American concept has encompassed all etiologies that may lead to irreversible loss of brain functions in respirator-maintained patients.

The British criteria resemble the American, however, in holding that death has been established when "all functions of the brain have permanently and irreversibly ceased."³ In measuring *functions*, physicians are not concerned with mere *activity* in cells or groups of cells if such activity (metabolic, electrical, etc.) is not manifested in some way that has significance for the organism as a whole. The same is true of the cells of the heart and lungs; they too may continue to have metabolic and electrical activity after

¹ See Appendix F, *infra*; Peter McL. Black *op. cit.*; Julius Korein, "Brain Death" *op. cit.*

² Conference of Royal Colleges and Faculties, *op. cit.* at 35. "Medicine and the Media," 281 *Brit. Med. J* 1064 (1980). See also A. Mohandas and Shelley Chou, "Brain death: A Clinical and pathological study," 35 *J. Neurosurg.* 211, 215 (1971) (authors of so-called "Minnesota criteria" hold that "the state of irreversible damage to the brain-stem... is the point of no return"). The more typical contrast between the American and British approaches is illustrated by the criteria employed at the University of Pittsburgh School of Medicine where "brain death" is defined as the "irreversible cessation of all brain function," as demonstrated by coma of established cause, absence of movements and brain stem reflexes, and an isoelectric EEG. David J. Powner and Ake Grenvik, "Triage in Patient Care: From Expected Recovery to Brain Death," 8 *Heart & Lung* 1103 (1979). The British rely instead on another observation, confirmed by the University of Pittsburgh, that "*prognosis* appears to be *similarly hopeless* for those patients who have clinical findings consistent with brain death but who have a nonisoelectric EEG." *Id.* at 1107 (emphasis added) (cited by British neurologist Christopher Pallis in lecture at Conference on Brain Death, Boston, Mass., April 4, 1981).

³ Conference of Royal Colleges and Faculties, *op. cit.* at 36.



death has been diagnosed by cardiopulmonary standards.¹ Tests that measure cellular activity are thus relevant to the determination of death only when they forecast whether missing functions may reappear.

Translating Medical Knowledge into Policy

Knowledgeable physicians agree that, when used in appropriate combinations, available procedures for diagnosing death by brain criteria are at least as accurate as the customary cardiopulmonary tests. Indeed, medical experts testified to the Commission that the risk of mistake in a competently performed examination was infinitesimal. Plainly, the results depend on the personal knowledge, judgment and care of the physicians who apply them. Expert witnesses before the Commission pointed out that many physicians (including some neurologists and neurosurgeons) are not sufficiently familiar with the criteria (much less the detailed tests) by which the cessation of total brain functions is assessed. As one step toward professional education, a group of physicians, working with the encouragement of the Commission, has developed a summary of currently accepted medical practices. (The statement appears as Appendix F to this Report.) Such criteria—particularly as they relate to diagnosing death on neurological grounds will be continually revised by the biomedical community in light of clinical experience and new scientific knowledge.

At present, the accepted norm is that the tests will be employed by a physician who has specialized knowledge of

¹ See also pp. 75-76 *infra*.

their use. Consultation with another appropriately trained physician is typically undertaken to confirm a brain-based diagnosis in an artificially supported individual before any decisions are made on whether to discontinue support.

Particular care must be exercised to establish the cause of the patient's condition and especially to rule out conditions (such as drug intoxication or treatable brain lesions) that can give the misleading appearance that brain functions have stopped irreversibly. (Research is currently underway to test whether hypothermia and large doses of barbiturates might be used to reduce brain injury after trauma or surgery. This will complicate the diagnosis of death in these patients.)

The Commission concludes that reliable means of diagnosis are essential for determinations of death and that the medical community has developed such means. Insistence that determinations of death accord with "accepted medical standards" would thus, in the opinion of the Commission, bring to bear all the usual stimuli for assuring accuracy in medical diagnosis: the testing of practices through biomedical research and the dissemination of the results of such research; the continuing education of physicians and other health care personnel; the conscientious application of professional skills and knowledge; and the encouragement of due care provided by professional standards and by state civil and criminal laws. In the Commission's view, it is not necessary—indeed, it would be a mistake—to enshrine any particular medical criteria, or any requirements for procedure or review, as part of a statute.

Understanding the "Meaning" of Death

3

It now seems clear that a medical consensus about clinical practices and their scientific basis has emerged: certain states of brain activity and inactivity, together with their neurophysiological consequences, can be reliably detected and used to diagnose death. To the medical community, a sound basis exists for declaring death even in the presence of mechanically assisted "vital signs." Yet before recommending that public policy reflect this medical consensus, the Commission wished to know whether the scientific viewpoint was consistent with the concepts of "being dead" or "death" as they are commonly understood in our society. These questions have been addressed by philosophers and theologians, who have provided several formulations.¹

The Commission believes that its policy conclusions, including the statute recommended in Chapter 5, must accurately reflect the social meaning of death and not constitute a mere legal fiction. The Commission has not found it necessary to resolve all of the differences among the leading concepts of death because these views all yield interpretations consistent with the recommended statute.

¹ See, e.g., Robert M. Veatch, *Death Dying and the Biological Revolution: Our Last Quest for Responsibility*, Yale University Press, New Haven, Conn., (1977) at 21-76; Douglas N. Walton, *Defining Death: An Analytic Study of the Concept of Death in Philosophy and Medical Ethics*, McGill-Queen's University Press, Montreal, Que. (1979); William C. Charron, "Death: A Philosophical Perspective on the Legal Definitions," 4 *Wash. U.L.Q.* 797 (1975); Dallas M. High, "Death: Its Conceptual Elusiveness," 55 *Soundings* 438 (1972); Paul Ramsey, *The Patient as Person: Explorations in Medical Ethics*, Yale University Press, New Haven, Conn. (1971) at 59-112; Stanley Hauerwas, "Religious Concepts of Brain Death and Associated Problems," 315 *Ann. N.Y. Acad. Sci.* 329 (1978).

Three major formulations of the meaning of death were presented to the Commission: one focused upon the functions of the whole brain, one upon the functions of the cerebral hemispheres, and one upon non-brain functions. Each of these formulations (and its variants) is presented and evaluated.

The "Whole Brain" Formulations

One characteristic of living things which is absent in the dead is the body's capacity to organize and regulate itself. In animals, the neural apparatus is the dominant locus of these functions. In higher animals and man, regulation of both maintenance of the internal environment (homeostasis) and interaction with the external environment occurs primarily within the cranium.

External threats, such as heat or infection, or internal ones, such as liver failure or endogenous lung disease, can stress the body enough to overwhelm its ability to maintain organization and regulation. If the stress passes a certain level, the organism as a whole is defeated and death occurs.

This process and its denouement are understood in two major ways. Although they are sometimes stated as alternative formulations of a "whole brain definition" of death, they are actually mirror images of each other. The Commission has found them to be complementary; together they enrich one's understanding of the "definition." The first focuses on the integrated functioning of the body's major organ systems, while recognizing the centrality of the whole brain, since it is neither revivable nor replaceable. The other identifies the functioning of the whole brain as the hallmark of life because the brain is the regulator of the body's integration. The two conceptions are subject to similar criticisms and have similar implications for policy.

The concepts: The functioning of many organs—such as the liver, kidneys, and skin—and their integration are "vital" to individual health in the sense that if any one ceases and that function is not restored or artificially re-placed, the organism as a whole cannot long survive. All elements in the system are mutually interdependent, so that the loss of any part leads to the breakdown of the whole and, eventually, to the cessation of functions in every part.²

² Germain Grisez & Joseph M. Boyle, Jr., *Life and Death with Liberty and Justice: A Contribution to the Euthanasia Debate*, University of Notre Dame Press, Notre Dame, Ind. (1979) at 59- 61.

If death is understood in theoretical terms as the permanent termination of the integrated functioning characteristic of a living body as a whole, then one can see why death of higher animals is usually grasped in factual terms by the cessation of the vital functions of respiration and circulation, which correlates so well with bodily decomposition. Breathing is the minimum in "social interaction." However, considering the role of the brain in the maintenance of the dynamic equilibrium of any system which includes a brain, there is a compelling reason for defining death in factual terms as that state of affairs in which there is complete and irreversible loss of the functioning of the entire brain. To accept this definition is not to make a choice based on one's evaluation of various human characteristics, but is to assent to a theory which fits the facts.

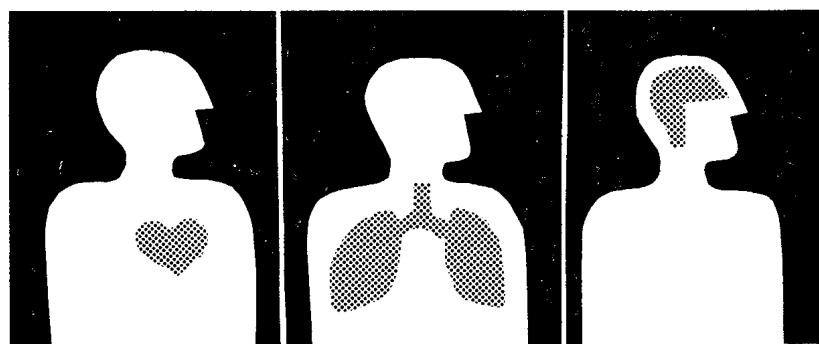
Three organs—the heart, lungs and brain—assume special significance, however, because their interrelationship is very close and the irreversible cessation of anyone very quickly stops the other two and consequently halts the integrated functioning of the organism as a whole. Because they were easily measured, circulation and respiration were traditionally the basic "vital signs." But breathing and heartbeat are not life itself. They are simply used as signs—as one window for viewing a deeper and more complex reality: a triangle of interrelated systems with the brain at its apex. As the biomedical scientists who appeared before the Commission made clear, the traditional means of diagnosing death actually detected an irreversible cessation of integrated functioning among the interdependent bodily systems. When artificial means of support mask this loss of integration as measured by the old methods, brain-oriented criteria and tests provide a new window on the same phenomenon.

On this view, death is that moment at which the body's physiological system ceases to constitute an integrated whole. Even if life continues in individual cells or organs, life of the organism as a whole requires complex integration, and without the latter, a person cannot properly be regarded as alive.

This distinction between systemic, integrated functioning and physiological activity in cells or individual organs is important for two reasons. First, a person is considered dead under this concept even if oxygenation and metabolism persist in some cells or organs. There would be no need to wait until all metabolism had ceased in every body part before recognizing that death has occurred.

More importantly, this concept would reduce the significance of continued respiration and heartbeat for the definition of death. This view holds that continued breathing and circulation are not in themselves tantamount to life. Since life is a matter of integrating the functioning of major organ systems, breathing and circulation are necessary but not sufficient to establish that an individual is alive. When an individual's breathing and circulation lack neurologic integration, he or she is dead.

The alternative "whole brain" explanation of death differs from the one just described primarily in the vigor of its insistence that the traditional "vital signs" of heartbeat and respiration were merely surrogate signs with no significance in themselves. On this view, the heart and lungs are not important as basic prerequisites to continued life but rather because the irreversible cessation of their functions shows that the brain had ceased functioning. Other signs customarily employed by physicians in diagnosing death, such as unresponsiveness and absence of pupillary light response, are also indicative of loss of the functions of the whole brain.



This view gives the brain primacy not merely as the sponsor of consciousness (since even unconscious persons may be alive), but also as the complex organizer and regulator of bodily functions. (Indeed, the "regulatory" role of the brain in the organism can be understood in terms of thermodynamics and information theory.³) Only the brain can direct the entire organism. Artificial support for the heart and lungs, which is required only when the brain can no longer control them, cannot maintain the usual synchronized integration of the body. Now that other traditional indicators of cessation of brain functions (i.e., absence of breathing), can be obscured by medical interventions, one needs, according to this view, new standards for determining death—that is, more reliable tests for the complete cessation of brain functions.

Critique: Both of these "whole brain" formulations—the "integrated functions" and the "primary organ" views—are subject to several criticisms. Since both of these conceptions of death give an important place to the integrating or regulating capacity of the whole brain, it can be asked whether that characteristic is as distinctive as they would suggest. Other organ systems are also required for life to continue—for example, the skin to conserve fluid, the liver to detoxify the blood.

³ Julius Korein, "The Problem of Brain Death: Development and History," 315 *Ann. N.Y. Acad. Sci.* 19 (1978).

The view that the brain's functions are more central to "life" than those of the skin, the liver, and so on, is admittedly arbitrary in the sense of representing a choice. The view is not, however, arbitrary in the sense of lacking reasons. As discussed previously, the centrality accorded the brain reflects both its overarching role as "regulator" or "integrator" of other bodily systems and the immediate and devastating consequences of its loss for the organism as a whole. Furthermore, the Commission believes that this choice overwhelmingly reflects the views of experts and the lay public alike.

A more significant criticism shares the view that life consists of the coordinated functioning of the various bodily systems, in which process the whole brain plays a crucial role. At the same time, it notes that in some adult patients lacking all brain functions it is possible through intensive support to achieve constant temperature, metabolism, waste disposal, blood pressure, and other conditions typical of living organisms and not found in dead ones. Even with extraordinary medical care, these functions cannot be sustained indefinitely—typically, no longer than several days—but it is argued that this shows only that patients with nonfunctional brains are dying, not that they are dead. In this view, the respirator, drugs, and other resources of the modern intensive-care unit collectively substitutes for the lower brain, just as a pump used in cardiac surgery takes over the heart's function.

This criticism rests, however, on a premise about the role of artificial support vis-a-vis the brainstem which the Commission believes is mistaken or at best incomplete. While the respirator and its associated medical techniques do substitute for the functions of the intercostal muscles and the diaphragm, which without neuronal stimulation from the brain cannot function spontaneously, they cannot replace the myriad functions of the brainstem or of the rest of the brain. The startling contrast between bodies lacking all brain functions and patients with intact brainstems (despite severe neocortical damage) manifests this. The former lie with fixed pupils, motionless except for the chest movements produced by their respirators. The latter can not only breathe, metabolize, maintain temperature and blood pressure, and so forth, on their *own* but also sigh, yawn, track light with their eyes, and react to pain or reflex stimulation.

It is not easy to discern precisely what it is about patients in this latter group that makes them alive while those in the other category are not. It is in part that in the case of the first category (i.e., absence of all brain functions) when the mask created by the artificial medical support is stripped away what remains is not an integrated organism but "merely a group of artificially maintained sub-

systems."⁴ Sometimes, of course, an artificial substitute can forge the link that restores the organism as a whole to unified functioning. Heart or kidney transplants, kidney dialysis, or an iron lung used to replace physically-impaired breathing ability in a polio victim, for example, restore the integrated functioning of the organism as they replace the failed function of a part. Contrast such situations, however, with the hypothetical of a decapitated body treated so as to prevent the outpouring of blood and to generate respiration: continuation of bodily functions in that case would not have restored the requisites of human life.

The living differ from the dead in many ways. The dead do not think, interact, autoregulate or maintain organic identity through time, for example. Not all the living can always do all of these activities, however; nor is there one single characteristic (e.g., breathing, yawning, etc.) the loss of which signifies death. Rather, what is missing in the dead is a cluster of attributes, all of which form part of an organism's responsiveness to its internal and external environment.

While it is valuable to test public policies against basic conceptions of death, philosophical refinement beyond a certain point may not be necessary. The task undertaken in this Report, as stated at the outset, is to provide and defend a statutory standard for determining that a human being has died. In setting forth the standards recommended in this Report, the Commission has used "whole brain" terms to clarify the understanding of death that enjoys near universal acceptance in our society. The Commission finds that the "whole brain" formulations give resonance and depth to the biomedical and epidemiological data presented in Chapter Two. Further effort to search for a conceptual "definition" of death is not required for the purpose of public policy because, separately or together, the "whole brain" formulations provide a theory that is sufficiently precise, concise and widely acceptable.

⁴ James L. Bernat, Charles M. Culver and Bernard Gert, "On the Definition and Criterion of Death," 94 *Ann. Int. Med.* 389, 391 (1981).

...When the respirator maintains the organism, it is questionable whether there is complete and irreversible loss of the functioning of the entire brain. But this is a question to be settled by empirical inquiry, not by philosophy. Philosophically, we answer the objection by saying that if the functioning of the brain is the factor which principally integrates any organism which has a brain, then if that function is lost, what is left is no longer as a whole an organic unity. If the dynamic equilibrium of the remaining parts of the system is maintained, it nevertheless as a whole is a mechanical, not an organic system.

Grisez & Boyle, *op. cit.* at 77

Policy Consequences: Those holding to the "whole brain" view—and this view seems at least implicit in most of the testimony and writing reviewed by the Commission—believe that when respirators are in use, respiration and circulation lose significance for the diagnosis of death. In a body without a functioning brain these two functions, it is argued, become mere artifacts of the mechanical life supports. The lungs breathe and the heart circulates blood only because the respirator (and attendant medical interventions) cause them to do so, not because of any comprehensive integrated functioning. This is "breathing" and "circulation" only in an analogous sense: the function and its results are similar, but the source, cause, and purpose are different between those individuals with and those without functioning brains.

For patients who are not artificially maintained, breathing and heartbeat were, and are, reliable signs either of systemic integration and/or of continued brain functioning (depending on which approach one takes to the "whole brain" concept). To regard breathing and respiration as having diagnostic significance when the brain of a respirator-supported patient has ceased functioning, however, is to forget the basic reasoning behind their use in individuals who are not artificially maintained.

Although similar in most respects, the two approaches to "whole brain death" could have slightly different policy consequences. The "primary organ" view would be satisfied with a statute that contained only a single standard—the irreversible cessation of all functions of the entire brain. Nevertheless, as a practical matter, the view is also compatible with a statute establishing irreversible cessation of respiration and circulation as an alternative standard, since it is inherent in this view that the loss of spontaneous breathing and heartbeat are surrogates for the loss of brain functions.

The "integrated functions" view would lead one to a "definition" of death recognizing that collapse of the organism as a whole can be diagnosed through the loss of brain functions as well as through loss of cardiopulmonary functions. The latter functions would remain an explicit part of the policy statement because their irreversible loss will continue to provide an independent and wholly reliable basis for determining that death has occurred when respirators and related means of support are not employed.

The two "whole brain" formulations thus differ only modestly. And even conceptual disagreements have a context; the context of the present one is the need to clarify and update the "definition" of death in order to allow principled decisions to be made about the status of comatose respirator-supported patients. The explicit recognition of

both standards-cardiopulmonary and whole brain-solves that problem fully. In addition, since it requires only a modest reformulation of the generally-accepted view, it accounts for the importance traditionally accorded to heartbeat and respiration, the "vital signs" which will continue to be the grounds for determining death in the overwhelming majority of cases for the foreseeable future. Hence the Commission, drawing on the aspects that the two formulations share and on the ways in which they each add to an understanding of the "meaning" of death, concludes that public policy should recognize both cardiopulmonary and brain-based standards for declaring death.

The "Higher Brain" Formulations

When all brain processes cease, the patient loses two important sets of functions. One set encompasses the integrating and coordinating functions, carried out principally but not exclusively by the cerebellum and brainstem. The other set includes the psychological functions which make consciousness, thought, and feeling possible. These latter functions are located primarily but not exclusively in the cerebrum, especially the neocortex. The two "higher brain" formulations of brain-oriented definitions of death discussed here are premised on the fact that loss of cerebral functions strips the patient of his psychological capacities and properties.

A patient whose brain has permanently stopped functioning will, by definition, have lost those brain functions which sponsor consciousness, feeling, and thought. Thus the higher brain rationales support classifying as dead bodies which meet "whole brain" standards, as discussed in the preceding section. The converse is not true, however. If there are parts of the brain which have no role in sponsoring consciousness, the higher brain formulation would regard their continued functioning as compatible with death.

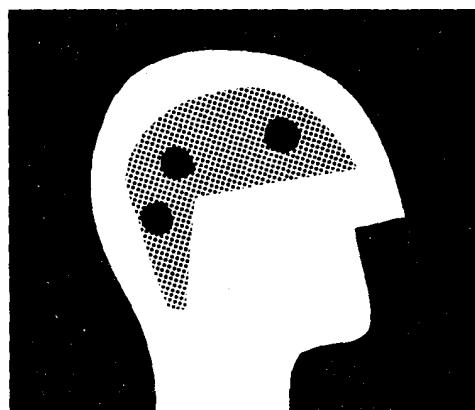
The Concepts: Philosophers and theologians have attempted to describe the attributes a living being must have to be a person.⁵ "Personhood" consists of the complex of activities (or of capacities to engage in them) such as thinking, reasoning, feeling, human intercourse which make the human different from, or superior to, animals or things. One higher brain formulation would define death as the loss of what is essential to a person. Those advocating the personhood definition often relate these characteristics to

⁵ H. Tristram Englehardt, Jr., "Defining Death: A Philosophical Problem for Medicine and Law," 112 *Ann. Rev. Respiratory Dis.* 587 (1975); Robert M. Veatch, "The Whole-Brain Oriented Concept of Death: An Outmoded Philosophical Formulation," 3 *J. Thanatology* 13 (1975).

brain functioning. Without brain activity, people are incapable of these essential activities. A breathing body, the argument goes, is not in itself a person; and, without functioning brains, patients are merely breathing bodies. Hence personhood ends when the brain suffers irreversible loss of function.

For other philosophers, a certain concept of "personal identity" supports a brain-oriented definition of death.⁶ According to this argument, a patient literally ceases to exist as an individual when his or her brain ceases functioning, even if the patient's body is biologically alive. Actual decapitation creates a similar situation: the body might continue to function for a short time, but it would no longer be the "same" person. The persistent identity of a person as an individual from one moment to the next is taken to be dependent on the continuation of certain mental processes which arise from brain functioning. When the brain processes cease (whether due to

decapitation or to "brain death") the person's identity also lapses. The mere continuation of biological activity in the body is irrelevant to the determination of death, it is argued, because after the brain has ceased functioning the body is no longer identical with the person.



Critique: Theoretical and practical objections to these arguments led the Commission to rely on them only as confirmatory of other views in formulating a definition of death. First, crucial to the personhood argument is acceptance of one particular concept of those things that are essential to being a person, while there is no general agreement on this very fundamental point among philosophers, much less physicians or the general public. Opinions about what is essential to personhood vary greatly from person to person in our society—to say nothing of intercultural variations.

The argument from personal identity does not rely on any particular conception of personhood, but it does require assent to a single solution to the philosophical prob-

⁶ Michael B. Green and Daniel Wikler, "Brain Death and Personal Identity," 9 *Phil. and Pub. Affairs* 105 (1980); Bernard Gert, "Personal Identity and the Body," *Dialogue* 458 (1971); Roland Puccetti, "The Conquest of Death" 59 *The Monist* 252 (1976); Azriel Rosenfeld, "The Heart, the Head and the Halakhah, N.Y. State J. Med. 2615 (1970).

lem of identity. Again, this problem has persisted for centuries despite the best attempts by philosophers to solve it. Regardless of the scholarly merits of the various philosophical solutions, their abstract technicality makes them less useful to public policy.

Further, applying either of these arguments in practice would give rise to additional important problems. Severely senile patients, for example, might not clearly be persons, let alone ones with continuing personal identities; the same might be true of the severely retarded. Any argument that classified these individuals as dead would not meet with public acceptance.

Equally problematic for the "higher brain" formulations, patients in whom only the neocortex or subcortical areas have been damaged may retain or regain spontaneous respiration and circulation. Karen Quinlan is a well-known example of a person who apparently suffered permanent damage to the higher centers of the brain but whose lower brain continues to function. Five years after being removed from the respirator that supported her breathing for nearly a year, she remains in a persistent vegetative state but with heart and lungs that function without mechanical assistance.⁷ Yet the implication of the personhood and personal identity arguments is that Karen Quinlan, who retains brainstem function and breathes spontaneously, is just as dead as a corpse in the traditional sense. The Commission rejects this conclusion and the further implication that such patients could be buried or otherwise treated as dead persons.

Policy Consequences. In order to be incorporated in public policy, a conceptual formulation of death has to be amenable to clear articulation. At present, neither basic neurophysiology nor medical technique suffices to translate the "higher brain" formulation into policy. First, as was discussed in Chapter One, it is not known which portions of the brain are responsible for cognition and consciousness; what little is known points to substantial interconnections among the brainstem, subcortical structures and the neocortex. Thus, the "higher brain" may well exist only as a metaphorical concept, not in reality. Second, even when the sites of certain aspects of consciousness can be found, their cessation often cannot be assessed with the certainty that would be required in applying a statutory definition.

Even were these difficulties to be overcome, the adoption of a higher brain "definition" would depart radically from the traditional standards. As already observed, the new standard would assign no significance to spontaneous

⁷ "Karen Ann Quinlan: A Family's Fate," May 26, 1981, *Wash. Post*, A at 1, col. 1.

breathing and heartbeat. Indeed, it would imply that the existing cardiopulmonary definition had been in error all along, even before the advent of respirators and other life-sustaining technology.

In contrast, the position taken by the Commission is deliberately conservative. The statutory proposal presented in Chapter Five offers legal recognition for new diagnostic measures of death, but does not ask for acceptance of a wholly new concept of death. On a matter so fundamental to a society's sense of itself—touching deeply held personal and religious beliefs—and so final for the individuals involved, one would desire much greater consensus than now exists before taking the major step of radically revising the concept of death.

Finally, patients declared dead pursuant to the statute recommended by the Commission would be also considered dead by those who believe that a body without higher brain functions is dead. Thus, all the arguments reviewed thus far are in agreement that irreversible cessation of all brain functioning is sufficient to determine death of the organism.

The Non-Brain Formulations

The Concepts: The various physiological concepts of death so far discussed rely in some fashion on brain functioning. By contrast, a literal reading of the traditional cardiopulmonary criteria would require cessation of the flow of bodily "fluids," including air and blood, for death to be declared. This standard is meant to apply whether or not these flows coincide with any other bodily processes, neurological or otherwise. Its support derives from interpretations of religious literature and cultural practices of certain religious and ethnic groups, including some Orthodox Jews⁸ and Native Americans.⁹

Another theological formulation of death is, by contrast, not necessarily related to any physiologic phenomenon. The view is traditional in many faiths that death occurs the moment the soul leaves the body.¹⁰ Whether this

⁸ J. David Bleich, "Neurological Criteria of Death and Time of Death Statutes," in Fred Rosner and J. David Bleich (eds.) *Jewish Bioethics*. Hebrew Publishing Co., New York (1979) at 303-316.

⁹ Telephone conversation with Richard E. Grant, Assistant Professor of Nursing, Arizona State University, July 17, 1981.

¹⁰ Milton McC. Gatch, "Death: Post-Biblical Christian Thought" in Warren T. Reich (ed.), *Encyclopedia of Bioethics* (v.1), MacMillan Publishing Co., N. Y., N.Y. (1976) at 249, 250; Saint Augustine, *The City of God*, Vernon H. Bourke (ed.) Image Books, Garden City, N. Y. (1958) at 269, 277; J. David Bleich, "Establishing Criteria of Death," in Fred Rosner and J. David Bleich (eds.), *Jewish Bioethics*, Hebrew Publishing Co., New York (1979) at 285.

happens when the patient loses psychological capacities, loses all brain functions, or at some other point, varies according to the teachings of each faith and according to particular interpretations of the scriptures recognized as authoritative.

Critique. The conclusions of the "bodily fluids" view lack a physiologic basis in modern biomedicine. While this view accords with the traditional criteria of death, as noted above, it does not necessarily carryover to the new conditions of the intensive care unit—which are what prompts the reexamination of the definition of death. The flow of bodily fluids could conceivably be maintained by machines in the absence of almost all other life processes; the result would be viewed by most as a perfused corpse, totally unresponsive to its environment.

Although the argument concerning the soul could be interpreted as providing a standard for secular action, those who adhere to the concept today apparently acknowledge the need for a more public and verifiable standard of death. Indeed, a statute incorporating a brain-based standard is accepted by theologians of all backgrounds.¹¹

Policy Consequences: The Commission does not regard itself as a competent or appropriate forum for theological interpretation. Nevertheless, it has sought to propose policies consistent with as many as possible of the diverse religious tenets and practices in our society.

The statute set forth in Chapter Five does not appear to conflict with the view that the soul leaves the body at death. It provides standards by which death can be determined to have occurred, but it does not prevent a person from believing on religious grounds that the soul leaves the body at a point other than that established as marking death for legal and medical purposes.

The concept of death based upon the flow of bodily fluids cannot be completely reconciled with the proposed statute. The statute is partially consistent with the "fluids" formulation in that both would regard as dead a body with no respiration and circulation. As noted previously, the overwhelming majority of patients, now and for the foreseeable

¹¹ Bernard Haring, *Medical Ethics*, Fides Publishers, Inc., Notre Dame, Ind. (1973) at 136; Charles J. McFadden, "The Dignity of Life: Moral Values in a Changing Society, Our Sunday Visitor, Inc. Huntington, Ind. (1976) at 202; Paul Ramsey, op. cit. at 59-112; Seymour Siegel, "Updating the Criteria of Death," 30 *Conservative Judaism* 23 (1976); Moses D. Tendler, "Cessation of Brain Function: Ethical Implications In Terminal Care and Organ Transplant," 315 *Ann. N.Y. Acad. Sci.* 394 (1978). See also pp. 13-14 *supra* and accompanying notes for a summary of the religious views presented to the Commission.

future, will be diagnosed on such basis. Under the statute, however, physicians would declare dead those bodies in which respiration and circulation continued *solely* as a result of artificial maintenance, in the absence of all brain functions. Nonetheless, people who believe that the continued flow of fluids in such patients means they are alive would not be forced by the statute to abandon those beliefs nor to change their religious conduct. While the recommended statute may cause changes in medical and legal behavior, the Commission urges those acting under the statute to apply it with sensitivity to the emotional and religious needs of those for whom the new standards mark a departure from traditional practice. Determinations of death must be made in a consistent and evenhanded fashion, but the statute does not preclude flexibility in responding to individual circumstances after determination has been made. A fuller discussion of the implications of the proposed statute for decisions about the dead is presented in Chapter Five.¹²

¹² See pp. 80-84 *infra*.

Who Ought to "Redefine" Death?

4

The developments in medical technology that permit maintenance of respiration and circulation have engendered broad social concern over unnecessary or inappropriate use of that technology. This, in turn, has provoked the call for new standards by which to determine that death has occurred. To respond, we must ask two questions: What sort of standards, and by whom devised and promulgated? The first question is easier to answer than the second.

As described in the preceding chapter and elaborated in Appendix F, the medical profession has generally accepted the new brain-based criteria as one means for diagnosing death. Yet medical criteria alone cannot meet the public concern, which arose not only because of advances that complicated the decisions of physicians, but also because the public perceived a departure from long-accepted social standards for differentiating life and death. This departure seemed to have momentous implications for many social practices and institutions. Criminal prosecution, inheritance, taxation, treatment of the cadaver, and mourning are all affected by the way society draws the dividing line between life and death.¹

That the definition of death can touch social life so profoundly, explains why the need for law is perceived. Legal standards for determining when death occurs evolved over the years. They sanctioned the "all bodily functions" view traditionally accepted by the public and practiced by physicians. Any newly formulated standard should attain equal recognition by the public and physicians before being adopted. One must turn, then, to the second question: Who ought to devise and announce the law "defining" death?

¹ See, e.g., Harold L. Hirsh, "Brain Death" 12 *Med. Tri. Tech. Q.* 377, 391 (1975); Kathleen Price, "Defining Death and Dying: A Bibliographic Overview," 71 *L. Library J.* 49, 59-63 (1978).

The Scope of Medical Authority

Traditionally, great deference has been paid to medical expertise in the making of diagnoses of death. As long as the standards employed by the profession were stable and basically congruent with opinion in the community at large, there was little reason for public scrutiny. The law simply reflected the common opinion about death and largely let the physicians—once their techniques and skills had risen to the necessary level of reliability—formulate and apply the tests to measure vital human functions. Yet the movement toward ever more sophisticated medical science, which produced treatments that interfered with the efficacy of the accepted tests, led medicine to new tests that were less comprehensible to the public. This made clear that a *choice* about the "definition" of death was at issue, a choice that ought to involve people beyond the biomedical community.

Furthermore, even the customary deference of the common law—which regarded the moment of a person's death as a "question of fact" for determination at trial largely on the basis of expert testimony² should not obscure the public choices that have been, and must be, made. For despite that deference, the standards applied to give legal effect to the testimony about death (medical as well as lay) were established by the courts "as a matter of law."³

Biomedical knowledge ought to continue to inform public policy in revising the legal standards concerning death. Physicians have taken the lead in reconsidering the criteria used in diagnosis. They now know what evidence is needed to attest the cessation of brain functions to be complete and irreversible. Furthermore, they can explain what this irreversible cessation means for various human capabilities and biological activities. But, in the end, the society as a whole must judge that these technical standards and the opinions they reflect conform to the society's settled values and accepted conceptions of human existence and personal rights.⁴ This judgment will be most clearly ex-

² See, e.g., Thomas v. Anderson, 96 Cal. App. 2d 371, 375, 215 P.2d 478, 482 (1950).

³ See, e.g., Smith v. Smith, 229 Ark. 579, 587, 317 S.W.2d 275, 279 (1958); *In re Estate of Schmidt*, 261 Cal. App. 2d 262, 273, 67 Cal. Rptr. 847, 854 (1968).

⁴ In light of the challenges that have been mounted to any professional prerogative in *establishing* the standards for determining that a human being has died, it may seem surprising that the traditional role of physicians in *applying* the standards has not been challenged. The difference in the tasks probably explains the lack of controversy in the latter situation. Application of an agreedupon standard is a matter for technical expertise, and it is not doubted that competent physicians (among others) possess the necessary proficiency in diagnosis.

pressed through the medium of the law of the land.

Judicial Revision of the Common Law

The medical profession itself has come to recognize the need for official action on the definition of death.⁵ Litigation involving physicians as defendants or as key witnesses has been largely responsible for this recognition. These cases made it clear that, surface appearances notwithstanding, the standards by which death is declared are not left to medical discretion alone. There may have been no statutes on death, but the "common law", which is to be found in the decisions of judges in prior cases, had established a legal standard.

It might appear simplest to change the common law on death—if change is needed—the same way it was made. Confronted with new biomedical developments—in the form of respirators that make comatose patients without brain functions appear "alive" and tests that show that they are really "dead"—judges might be expected to bring the judicially established standards into line. Predictably, how-ever, while some courts adhered to existing law, others cautiously moved away from it.⁶ No clear pattern emerged. This is one of several reasons for doubting that judicial revision of the common law presents a promising route to death policy reform, although it does not counsel against appropriate rulings by judges as cases are presented in which the need to "update" the "definition" arises.

A judge's unwillingness to alter the common law on death does not necessarily mean that the judge adheres unthinkingly to tradition or unreasonably resists new knowledge. Anglo-American jurisprudence is based on precedents. It places great value on evenhandedness among litigants and on assuring everyone that the rules by which they conduct themselves will "not be changed in the middle of the game."⁷ Allowing judges to decide every rule of law anew in every case would jeopardize the impartiality of the judicial process and place an impossible burden on the courts.

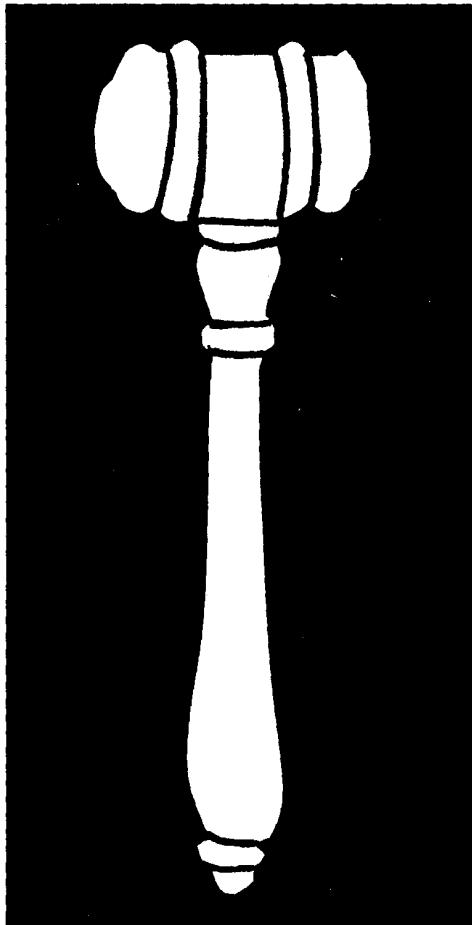
Nonetheless, precedents must be rethought; such rethinking may occasionally lead to bold statements of new rules of law, rather than the incremental (indeed, often imperceptible) modifications favored in judge-made law. Some judges have made sweeping changes regarding the "redefinition" of death (these are discussed in detail in

⁵ Frank J. Veith, Jack M. Fein, Moses D. Tendler, Robert M. Veatch, Marc A. Kleiman and George Kalkines, "Brain Death: II. A Status Report of the Legal Considerations" 238 *I.A.M.A.* 1744 (1977).

⁶ The judicial rulings on the "definition" of death appear in Appendix D.

⁷ Woods v. Lancet, 303 N.Y. 349, 354, 102 N.E. 2d 691, 695 (1951).

Chapter Five). More can be expected over time. Additional reasons militate, however, against relying on common law revision as the primary route to revising the standards for declaring that a person has died.



First, the judicial route would extend the period of uncertainty. This could be unfortunate since the application of some standards could cause unwarranted prolongation of treatment (for bodies that have died) while the application of others could cause premature termination of useful treatment (for patients still alive by "whole brain" criteria). A period of legal uncertainty arises because courts cannot simply "declare" law whenever they decide to do so; revision of the common law awaits litigation in which the parties contend over a particular rule of law in the context of a factual dispute. The parties usually identify the issues, articulate the scope and nature of the dispute, provide the le-

gal reasoning and expert testimony, and propose outcomes. The parties to a dispute may present differing views of an issue without presenting all views or even the true polar positions. A judge may not know enough about a field to recognize the need for expert witnesses to supplement the litigants' positions. Anglo-American courts have neither authority nor personnel to conduct independent investigations.

Furthermore, even when courts rule on cases, they do not always "make law." The outcome of a jury trial, for example, is the verdict, usually a simple conclusion to an often complex and secret process. Unless appeal is taken to a higher court, that part of the trial process which is public—namely, the judge's rulings on evidence and instructions to the jury—will not emerge in a form that would give them value as a precedent. In most states the appellate process has multiple levels; proceeding through the court system to the highest court involves much time and expense. Only the latter court can promulgate law binding on

all the lower courts in the jurisdiction. Finally, even when a case has been decided by the highest court, the "holding" which the case establishes is, strictly speaking, limited to the facts of that case. Courts sometimes state their conclusions in broad terms, of course. But the "obiter dicta"—that is, the court's comments incidental rather than necessary to its decision—are often disregarded. Moreover, the standard declared in a homicide case involving the victim's having been disconnected from the respirator that the defense maintains was keeping him "alive" might be disregarded in a later inheritance case involving the time of death.⁸ Also, if the facts of two cases—even those in the same field of law—are sufficiently distinguishable, the ruling of one might not be applied in the second.

Beyond differences in the resulting rules supposedly rooted in the particular (and perhaps peculiar) facts of each case, other variations are likely to arise from the difficulties judges have in stating their conclusions about a specialized field that is probably unfamiliar to them. Further, judges may be quite tempted to "improve" on the decisions of courts that have dealt previously with the subject. Thus, although general rules may emerge from judicial decisions, they emerge slowly and somewhat roughly—despite the pains taken.

In some areas of the law, piecemeal modification of rules is rightly seen as a great strength of the common law. A federal system, such as that of the United States, magnifies this process by greatly increasing the number of appellate courts ruling on an issue in a "binding" fashion. As desirable as this step-by-step process may seem, a persistent diversity of standards on a matter as fundamental as the "definition" of death does not seem desirable. There is nothing to applaud in the prospect that small, and perhaps inadvertent, differences in the opinions of the highest courts in two neighboring states might make a "live" patient "dead" as the ambulance carrying him or her crosses their border.

Legislative Reform

Judicial revision of the common law is too dilatory to dispel public confusion and professionals' doubts. Its tardiness and conservatism may fail to capture the movement of public values, frustrating the norms of participation and pluralism that are important in our society.

Legislative modification—the adoption of a statute to supplement or supplant the common law on death—could include public hearings through which members of the general public would both become more familiar with the issue

⁸ See Chapter 5, n.42 and accompanying text, and Appendix D at 137 -38. *infra*

and have their views taken into account in the framing of policy. Legislators, acting directly through legislative committees or with the aid of special purpose study commissions, can investigate both public views and the full range of expert opinion. The views of many groups—representing patients, religious bodies, professional groups, and the general public—should be heard on the "definition" of death. The legislative process easily accommodates the full range of views, unlike the more closed and formal judicial process. (The Commission, in considering the statute recommended in this Report, was likewise able to hear a wide range of professional and lay opinion.)

Legislative reform also has its risks, one of the most prominent being poor drafting. This is a particular danger when issues appear highly technical, uninteresting to legislators, and unlikely to generate passionate feelings. None of these factors should characterize the process of "defining" death, accurately assessed. Though the question has technical aspects, the task of the legislature is not to do the work of physicians in developing medical criteria for diagnosis but to establish the general standards to which society will give legal significance. Similarly, although the attention of the legislature is not likely to be focused on the task of "defining" death the way it is on issues involving economic and political matters that provoke powerful interest groups, there is no question that the subject is one of basic importance to any society: who is alive and who is dead? Finally, the subject is most likely to engender passion when misunderstood, particularly when it becomes confused with the distinct but related question of terminating treatment of respirator-supported patients who still have brain functions although they may not be conscious. With a little care, discussion can be confined to the topic at hand—the recognition of a new formulation of the standards for determining death—standards on which there appears to be general professional and public consensus.

A statute on death ought to guide physicians and others in decision-making about respirator-maintained patients; it ought also to educate those who must make legal and policy decisions. "Legislation will not remove the need for reasoned interpretation—first by physicians and perhaps then by judges—but it can restrict the compass within which they make their choices to one which has been found acceptable by the public."⁹ Furthermore, if legislators are guided by a single model bill the likelihood of statutory law that is uniform in language and intent is greatly increased.

⁹Alexander M. Capron and Leon R. Kass, "A Statutory Definition of the Standards for Determining Human Death: An Appraisal and a Proposal," 121 *U. Pa. L. Rev.* 87, 101 (1972).

In sum, while the Commission believes that courts should update the standards for declaring death as the issue arises in litigation, it does not think the formulation of new standards should have to await judicial decision. Besides the uncertainty engendered, litigation (civil or criminal) involves time, expense and psychological trauma; it would be unfortunate for society to have to rely on retrospective determination of the basic rules concerning such a fundamental problem as the "definition" of death. The legislative alternative may have drawbacks; still the Commission concludes that (subject to the guidance provided in the next chapter) it is the better course.

The Federal Role

The articulation of standards for determining that a human being has died has traditionally been a matter for state rather than federal law. Necessarily, this allocation of lawmaking responsibility gives rise to the possibility of variations among the laws of the several states. In the field of concern here, just such variation has come about over the past decade, as some states have made statutory or judicial changes in their "definition" of death and others have not.



For reasons set forth more fully in the next chapter, the Commission believes that uniformity on this matter is a desirable goal. One would expect the same basic rule about who is dead, and who is not, to apply everywhere in the United States. Moreover, since certainty and clarity are

highly valuable in this area, uniformity of statutory language would be preferable lest differences in words seem to open the door to differences in substance.

The federal government could respond to the harm that is risked by diversity in the states' legal rules for determining death by passing a statute intended to preempt the field. The Commission believes that such action would be premature, before seeing whether the states all adopt the Uniform Determination of Death Act and secure uniformity that way. Until this is tried, there is no justification for disturbing the traditional allocation of state and federal responsibilities on this subject.

The federal government may have two constructive (and non-coercive) roles to play in defining death, however. First, the federal government can usefully bring together experts and representatives of different streams of thought on the matter, seek to clarify the issues at stake, and facilitate cooperative formulation of a statute and medical criteria. The Commission has attempted to perform precisely this role through its hearings, its participation in law reform efforts, its encouragement of medical groups to examine the reliability of criteria for diagnosing death, and its publication and distribution of this Report.

Second, the federal government should "define death" for matters under direct federal jurisdiction. When legal disputes arise in such places—for example, military installations (including military hospitals), Indian reservations, and other federal preserves¹⁰—governing law may be either that of the state within which the place is located or special federal law applicable to such places.

Federal law arises in some instances from Congressional enactment and in others from the decisions of federal judges, who have on occasion created a "federal common law" rule different from existing state law.¹¹ A federal judge faced with an issue turning on the "definition" of

¹⁰U.S. CONST. Art. 1, § 8, cl. 17, "The Congress shall have Power. . . . To exercise exclusive Legislation in all Cases whatsoever. . . over all Places purchased by the Consent of the Legislature of the State in which the Same shall be, for the Erection of Forts, Magazines, Arsenals, dock-Yards, and other needful Buildings," U.S. CONST, Art. 4, § 3, cl. 2, "The Congress shall have Power to dispose of and make all needful Rules and Regulations respecting the Territory or other Property belonging to the United States,"; 18 U.S.C. 7 (statute defining special maritime and territorial jurisdiction of the United States for the purpose of federal criminal law.)

¹¹ The "international rule" of Chicago, Rock Island & Pacific Ry. v. McGlinn, 114 U.S. 542 (1885), under which the rules of state law existing at the time the federal enclave was acquired continue to apply until the federal government imposes a new rule has been substantially weakened by Howard v. Commissioners, 344 U.S. 14 (1953) and its progeny, which accept coexisting state authority over federal enclaves provided that state law does not interfere with federal jurisdiction. Some relief from the problems faced by individuals who reside on federally owned land which "are especially acute where the litigation arises from acts occurring upon the enclave itself," Richard T. Altieri, "Federal Enclaves: The Impact of Exclusive Legislative Jurisdiction upon Civil Litigation," 72 *Military L. Rev.* 55 (1976), is provided by federal statutes making state law governing, for example, wrongful death, 16 U.S.C. 457 (1970), and criminal law, 18 U.S.C., 14 (1970), applicable to federal enclaves. See generally U.S. Attorney General, *Report of the Interdepartmental Committee for the Study of Jurisdiction over Federal Areas Within the States* (1957); Note, "The Federal Common Law," 82 *Harv. L. Rev.* 1512 (1969).

death applicable in a federal preserve would probably rely upon the standard for determining death in force in the state where the federal land was located. If that state has failed to update its legal standard to reflect the developments discussed in this Report, the Commission believes that it would be appropriate for the court to take account of the material discussed in this Report and to employ a legal standard that includes irreversible cessation of total brain functions as well as irreversible cessation of heart and lung functions. To promote uniformity, the court ought to establish the more inclusive standard as a matter of federal common law.

It would be both simpler and more certain, however, were the federal rule to follow the route the Commission as endorsed for state law, namely the adoption of a statute. Accordingly, the Commission recommends that the Congress adopt the Uniform Determination of Death Act proposed in this Report as the governing rule in instances falling within federal jurisdiction. (The statute should be enacted as a definitional provision of general application, probably as an amendment to Title 1 of the United States code.)

The Commission believes that federal adoption of the statute recommended herein for use in only these matters already under direct federal jurisdiction would be salutary in its own right. Furthermore, without in any way coercing the States, federal adoption would offer useful encouragement to the States to place this matter on their legislative agendas.

What "Definition" Ought to be Adopted?

5

The Commission has concluded that legislatures ought to set the rules for determining human death and that those rules should recognize brain-oriented techniques of establishing death because traditional standards often cannot be employed with patients whose respiration and circulation are artificially maintained. This chapter asks: by what principles should the drafting of a statute on death be guided, how does the law stand at present, and what would a good statute provide?

The Specificity of Public Policy

A statute on death should guide those who will decide whether (and if so, when) a person has passed from being alive to being dead. Such guidance can be general or specific. An initial question for legislative drafters is what level of detail should be incorporated within a statute and what supporting concepts or details can be drawn from other sources. Four levels of generality for such a "definition" have been suggested:¹

The *basic concept* of death is fundamentally a philosophical matter. Examples of possible "definitions" of death at this level include "permanent cessation of the integrated functioning of the organism as a whole," "departure of the animating or vital principle," or "irreversible loss of personhood." These abstract definitions offer little concrete help in the practical task of

¹ Alexander M. Capron and Leon R. Kass, "A Statutory Definition of the Standards for Determining Human Death: An Appraisal and a Proposal," 121 U. Po. L. Rev. 87, 102-104 (1972); See also Robert M. Veatch, *Death, Dying and the Biological Revolution: Our Last Quest for Responsibility*, Yale University Press, New Haven, Conn. (1977) at 68; Task Force on Death and Dying of the Institute of Society, Ethics and the Life Sciences, "Refinements for the Determination of Death: An Appraisal," 221 J.A.M.A. 48, 52 (1972).

determining whether a person has died but they may very well influence how one goes about devising standards and criteria.

In setting forth the *general physiological standard(s)* for recognizing death, the definition moves to a level which is more medico-technical, but not wholly so. Philosophical issues persist in the choice to define death in terms of organ systems, physiological functions, or recognizable human activities, capacities, and conditions. Examples of possible general standards include "irreversible cessation of spontaneous respiratory and/or circulatory functions," "irreversible loss of spontaneous brain functions," "irreversible loss of the ability to respond or communicate," or some combination of these.

Operational criteria further define what is meant by the general physiological standards. The absence of cardiac contraction and lack of movement of the blood are examples of traditional criteria for "cessation of spontaneous circulatory functions," whereas deep coma, the absence of reflexes, and the lack of spontaneous muscular movements and spontaneous respiration are among criteria proposed for "cessation of spontaneous brain functions" by the Harvard Committee.

Fourth, there are the *specific tests and procedures* to see if the criteria are fulfilled. [Measurement of] pulse, heart beat, and blood pressure, electrocardiogram, and examination of blood flow in the retinal vessels are among the specific tests of cardiac contraction and movement of the blood. Reaction to painful stimuli, appearance of the pupils and their responsiveness to light, and observation of movement and breathing over a specified time period are among specific tests of the "brain function" criteria enumerated above.

The Commission has concluded that legislation should be formulated at the second level, that of general standards. Broader formulations would lead down arcane philosophical paths which are at best somewhat removed from practical application in the formulation of law. To truly redefine the very concepts of life and death, such a course might be necessary; but that is not the Commission's objective. Physicians, applying the traditional procedures that corresponded to societal expectations, were not maintaining that death is the irreversible loss of heart and lung functions. They were affirming only that the loss of those functions *indicated* that a person had died. Modern treatments that interfere with these indicators do not necessitate a change in concepts, provided that alternative indicators of the current

concept are available. As discussed in Chapters Two and Three, the brain-oriented indicators provide such an alternative. Thus, it seems proper to proceed on the assumption that the widespread agreement in traditional understanding of death (i.e., that it is manifested by cessation of spontaneous cardiopulmonary functioning) would apply equally for alternative procedures congruent with the traditional concept.

The third and fourth levels of specificity have problems opposite to those of the first. Agreement might be reached about the details, but this agreement would be fleeting, since new criteria and tests—unlike new concepts—will be repeatedly generated by changes in biomedical knowledge and clinical abilities. It would seem more realistic to leave the technical details to physicians and other biomedical scientists. Once the public has set its goal, specialists in the field can be delegated the responsibility of elaborating the means toward it.

The distinction between general standards (which a statute ought to articulate) and operational criteria (which are better left to medical bodies to establish) is not always recognized. The term "criteria" reflects the usage of the *ad hoc* Harvard committee whose 1968 report on "the definition of irreversible coma" brought the issue to the fore.² In the years since that group made its recommendations, the criteria by which an irreversible cessation of total brain functioning is detected have been repeatedly revised.³ Were a statute to incorporate such criteria, its inflexibility might chill the development of more accurate criteria and of faster, more precise, and more economical tests. By remaining at a slightly greater level of generality—e.g., "irreversible cessation of all functions of the entire brain"—a statute may be able to remain valid indefinitely and not to require repeated amendments.

The Objectives to be Sought

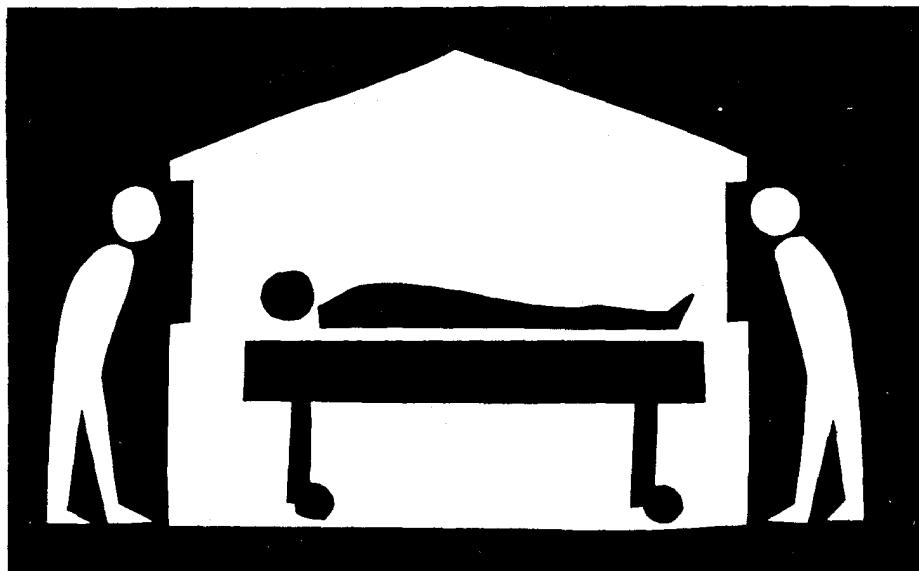
General principles of drafting—such as clarity and brevity—apply as well to a statute on the standards for death determination as to any legislation. But there are also certain objectives particular to the subject at hand.

Death is a Single Phenomenon: The statute must address the right question. The Commission conceives the question to be, "how, given medical advances in cardiopulmonary support, can the evidence that death has

² Ad Hoc Committee of the Harvard Medical School to Examine the Definition of Brain Death, "A Definition of Irreversible Coma," 205 *I.A.M.A.* 337 (1968).

³ Black, *op. cit.*: Ronald E. Cranford, "Minnesota Medical Association Criteria: Brain Death: Concept and Criteria," 61 *Minn. Med.* 600 (1978).

occurred be obtained and recognized 1" When the presence of a mechanical ventilator precludes the use of traditional vital signs (*i.e.*, respiration and heartbeat) to ascertain whether a person is alive, the use of brain-based criteria provides another means of making such a determination. Thus, brain-based criteria do not introduce a new "kind of death", but rather reinforce the concept of death as a single phenomenon—the collapse of psycho-physical integrity. The statute merely allows new ways to recognize that this phenomenon has occurred.



Death of the Organism as a Whole: The death of a human being—not the "death" of cells, tissues or organs—is the matter at issue. The cessation of vital bodily systems provides the basis for broad standards by which death can be judged to have occurred. But such functional cessation is not of interest in and for itself, but for what it reveals about the status of the person. What was formerly a person is now a dead body and can be socially and legally treated as such. Although absence of breathing and heartbeat may often have been spoken of as "defining" death, review of history and of current medical and popular understanding makes clear that these were merely evidence for the disintegration of the organism as a whole, as discussed in Chapter Three.

Incremental (Not Radical) Change: Two advantages of the traditional vital signs were their accessibility to measurement (not only by the medically-trained) and their obvious connection to the reality of death as perceived in everyday life. Although fewer and fewer people actually witness death (how many children, for example, today are gathered with their families around the death bed of an elderly relative?), most Americans still feel they recognize the manifest signs of death, at least through the arts and the communications media, if not first-hand. The "whole brain" signs of

life and death are less well comprehended by nonspecialists, and they measure functions that are less clearly manifest. The heart and the lungs move when they work; the brain does not. Thus, since any incorporation of brain-oriented standards into the law necessarily changes the type of measures permitted somewhat, a statute will be more acceptable the less it otherwise changes legal rules.

Conservatism seems justified in articulating a rule that will not only be applied within the legal system but will also guide the beliefs and behavior of physicians and the public. People's attitudes toward death evolve, and changes in medical capabilities certainly come to be reflected in public as well as professional circles: heart transplantation, for example, cannot help but alter the romantic notion of the heart as the seat of soul or personality. Change does not occur overnight, however, and there seems to be no reason to force it by statute when wrenching change is not necessary. Any statute on death should, therefore, supplement rather than supplant the existing legal concept.

The conservative nature of the reform here proposed will be more apparent if the statute refers explicitly to the existing cardiopulmonary standard for determination of death. The brain-based standard is, after all, merely supplementary to the older standard, which will continue to be adequate in the overwhelming majority of cases in the foreseeable future. Indeed, of all hospital deaths at four acute hospitals in the Commission's survey, only about 8 percent could have been declared dead by neurologic criteria prior to cardiac arrest. The study clearly illustrates that the use of cardiopulmonary criteria predominates. In the first place, the brain-based criteria are relevant only to a limited patient population (*i.e.*, comatose patients on respirators). Even among this population, only one-fourth of those who died at the four acute care centers in the Commission's study met brain-based criteria before meeting the cardiopulmonary standard. Moreover, among those in that population who are likely to *meet* the criteria, cardiac standstill sometimes intervenes (*i.e.* cardiopulmonary criteria are met) prior to completion of the waiting period necessary to confirm the irreversibility of the loss of brain functions. In addition, as the Commission's study illustrates, physicians who conclude that still living patients have no chance for recovery sometimes forego extraordinary treatment; as a result, patients who might have met brain-based criteria if placed on respirators die instead from cardiac standstill or collapse. Thus, although brain-based criteria are needed in those cases where traditional criteria cannot be applied, these instances at present represent, and will in all probability continue to represent, a small percentage of all determinations of death.

Uniformity Among People and Situations: Besides moving slowly, the law ought to move evenhandedly. The statute, ought not to reinforce the misimpression that there are different "kinds" of death, defined for different purposes, and hence that some people are "more dead" than others.

In many contexts, definitions are handmaidens to other purposes lawmakers are seeking to achieve. Rather than asking "what is death"? one might ask, "what difference does it make whether somebody is dead"?⁴ That question has many answers, most of them familiar to everyone. Criminal law (murder v. aggravated assault), tort law (wrongful death), family law (the status of spouse and children), property and estate law, insurance law (payment of life insurance benefits and termination of health insurance payments), and tax law, as well as some actions and culturally determined behaviors of family members, physicians, clerics and undertakers are all initiated by the determination that a death has occurred. Were there good reason for one branch or another of the law or one or another cultural institution to employ a different "definition" of death, logic would not preclude such a step. But in fact, society has found it desirable to employ a single standard for declaring death in all these circumstances and no special-purpose definitions have been seriously advanced. Calling the same person "dead" for one purpose and "alive" for another would engender nothing but confusion.⁵ Thus, in setting forth the law in statutory form, the wisest and most cautious course (furthering the principle of incrementalism as well) would be to adopt a rule recognizing the unity of the concept of death. Such a "definition" of death can be applied in all appropriate circumstances; if a special need is identified for acting on a different basis, a separate status—other than that of being "dead"—could be defined for that purpose.⁶

⁴ Roger B. Dworkin, "Death in Context," 48 *Ind. L. J.* 623, 629 (1973).

⁵ See, e.g. Fred Fabro, "Bacchichiochi vs. Johnson Memorial Hospital" 45 *Conn. Med.* 267 (1981) chronicling the troublesome case of Melanie Bacchichiochi. On February 11, 1981 after repeated clinical examinations confirmed by electroencephalography, physicians found she had suffered irreversible loss of total brain function. Her physician was unwilling to remove her from the respirator because of legal uncertainty since Connecticut's statute on "brain death" applies only to organ transplantation. "It is ironic that if the patient had been a donor, she could have been pronounced dead on February 11 and the respirator could have been withdrawn. Dead for transplantation, but not dead otherwise!" *Id.* at 268.

⁶ Alexander M. Capron, "The Purpose of Death: A Reply to Professor Dworkin," 48 *Ind. L.J.* 640, 643-45 (1973); Capron and Kass, *op cit.* at 107-08.

Adaptability to Advances in Technique: Some, particularly in the medical community, have voiced a fear of statutory "inflexibility". A statute should apply uniformly at anyone time, but it need not fix at the current level of scientific sophistication or biomedical technology the means by which it is to be implemented. In the terms used earlier, a statute should be confined to the standards by which death is to be determined and leave to experts in biomedicine the continuing development of criteria and specific tests that fulfill them.

The Legal Changes That Have Occurred

The gap between the common law definition of death and the skills of modern medicine has not gone unnoticed by lawmakers. Spurred initially by the interest in transplantation,⁷ later by the widely publicized tragedy of Karen Ann Quinlan,⁸ and finally by a recognition of the perplexities in the civil and criminal law processes, legislators in twenty-seven states⁹ have enacted statutes that permit reliance on brain-oriented criteria for determining death. Moreover, in several states where legislators had not yet acted,¹⁰ judges have given some recognition to similar standards.¹⁰ (Statutory and common law developments are discussed at greater length in Appendices C and D of this Report; the international trends are surveyed in Appendix E.)

⁷ David Sanders and Jesse Dukeminier, Jr., "Medical Advance and Legal Lag: Hemodialysis and Kidney Transplantation," 15 *U.C.L.A. L. Rev.* 357,410 (1968).

⁸ Although the *Quinlan* case focused public attention on the capabilities of intensive medical care to resuscitate comatose individuals, legislation of the type recommended in this Report and already adopted in some states would not hold Karen Quinlan to be dead. As this Report has repeatedly emphasized, situations like Ms. Quinlan's do not involve determinations of death but rather decisions about whether to cease treatment of patients with no prospect of recovery to consciousness. This is a distinct bioethical and legal issue receiving separate attention from the President's Commission. Joseph Quinlan and Julia Quinlan (with Phyllis Battelle), *Karen Ann: The Quinlans Tell Their Story*, Doubleday and Co., Garden City, N. Y. (1977); *In the Matter of Karen Ann Quinlan: The Complete Briefs, Oral Arguments and the Opinion of the New Jersey Supreme Court*, Washington, D.C., University Publications of America, Inc. (1975) (2v.); *In Re Quinlan*, 70 N.J. 10 (1976).

⁹See Appendix C, Parts I and III, *infra*.

¹⁰ See Appendix D, *infra*.

Legislative Developments: The statutes proposed or adopted fall into seven basic groups (see Figure 3).

The Kansas-Inspired Statutes: In 1970 the Kansas legislature took the first legal action in an American jurisdiction recognizing brain-based criteria for the determination of death. The Kansas Supreme Court had shortly before then reiterated its adherence to the common law standard of "complete cessation of *all* vital functions... even if artificially maintained."¹¹ The statute, proposed by a physician-legislator and adopted without substantial debate, provides alternative "definitions" of death, one based upon traditional heart-lung functions and the other upon brain functions.

A person will be considered medically and legally dead if, in the opinion of a physician, based on ordinary standards of medical practice, there is the absence of spontaneous respiratory and cardiac function and, because of the disease or condition which caused, directly or indirectly, these functions to cease, or because of the passage of time since these functions ceased, attempts at resuscitation are considered hopeless; and, in this event, death will have occurred at the time these functions ceased; or

A person will be considered medically and legally dead if, in the opinion of a physician, based on ordinary standards of medical practice, there is the absence of spontaneous brain functions; and if based on ordinary standards of medical practice, during reasonable attempts to either maintain or restore spontaneous circulatory or respiratory function in the absence of aforesaid brain function, it appears that further attempts at resuscitation or supportive maintenance will not succeed, death will have occurred at the time when these conditions first coincide. Death is to be pronounced before artificial means of supporting respiratory and circulatory function are terminated and before any vital organ is removed for purposes of transplantation.

These alternative definitions of death are to be utilized for all purposes in this state, including the trials of civil and criminal cases, any laws to the contrary notwithstanding.¹²

With slight variations, in 1972 Maryland,¹³ and in 1973

¹¹ United Trust Co. v. Pyke 199 Kan. 1,4,427 P.2d 67,71 (1967).

¹² Kan. Stat. Ann. §77-202 (Supp. 1971).

¹³ Md. Code Ann., Art. 43, §54F (1972).

New Mexico¹⁴ and Virginia,¹⁵ enacted statutes patterned on the Kansas model. (In 1975 Oklahoma adopted a statute drawn solely from the second "alternative definition" of the Kansas prototype.¹⁶)

The dual nature of the Kansas statute is its most troublesome feature. The alternative standards are set forth in two separate, complex paragraphs without a description of how they were to be related to the single phenomenon, death. When the statute was enacted, transplantation was very much in the news. The two-pronged statute seems to create one definition of death for most people and another, apparently more lenient standard for "harvesting" organs from potential donors.

The Capron-Kass Proposal: To overcome the confusion of the "two deaths" problem, Professor Alexander Morgan Capron and Dr. Leon R. Kass proposed a model statute in a 1972 law review article.¹⁷ Substantially shorter than the Kansas version, it spelled out how the two standards for death were related. It also avoided language in the Kansas statute about "hopeless" treatment that may have implied that the statute had to do with terminating treatment for dying patients rather than defining when death occurs. As subsequently revised by Professor Capron, it states:

A person will be considered dead if in the announced opinion of a physician, based on ordinary standards of medical practice, he has experienced an irreversible cessation of respiratory and circulatory functions, or in the event that artificial means of support preclude a determination that these functions have ceased, he has experienced an irreversible cessation of total brain functions. Death will have occurred at the time when the relevant functions ceased.¹⁸

Seven states have adopted versions of the Capron-Kass model. Alaska, Iowa, Louisiana and Michigan enacted the statute with only minor modifications,¹⁹ while other states

¹⁴ N. M. Stat. Ann. §12-2-4 (1978).

¹⁵ Va. Code §54.325.7 (1979).

¹⁶ Okla. Stat. Ann. tit. 63,§1-301(g) (West 1975).

¹⁷ Capron and Kass, *op. cit* at 111.

¹⁸ Alexander M. Capron, "Legal Definition of Death," 315 *Ann. N.Y. Acad. Sci.* 349,356 (1978).

¹⁹ Alaska Stat. §09. 65. 120 (Cum. Supp. 1979); Iowa Code Ann. §702.8 (West 1979); La. Rev. Stat. Ann. §9:111 (West Cum. Supp. 1980); Mich. Stat. Ann. §§14.15 (1021) to (1024) (1979).

have made more substantial modifications,²⁰ which are discussed at length in Appendix C.

The American Bar Association Proposal: The ABA proposed its own model statute in 1975. It resembled a California law enacted in the previous year.²¹ The ABA statute states:

For all legal purposes, a human body, with irreversible cessation of total brain function, according to usual and customary standards of medical practice, shall be considered dead.²²

Some version of the ABA model statute can be found on the books of five states.²³ Montana and Tennessee adopted the proposal verbatim.²⁴ Illinois employed largely the same language but, regrettably, inserted it as an amendment to the state's Uniform Anatomical Gift Act, thus creating the impression that it applies only to organ donors.²⁵ Because it ignores determinations of death based on the traditional cardiopulmonary criteria, a "single standard" statute of the ABA-type might appear to be irrelevant to most patients. To avoid this problem, several states, including California, amended the statute to permit determinations to be made based on "other usual and customary procedures"—unfortunately, without explicating these terms or their relationship to the brain-based standards. The inclusion of this second undefined alternative resurrects—indeed, magnifies—the "two (unrelated) deaths" problem of the Kansas statute.

²⁰ Ala. Code § §22-31-1 to 22-31-4 (Cum. Supp. 1979) (accepts other, unspecified procedures; provides for "independent confirmation of death" by a second doctor when brain criteria are used or transplantation is planned; excludes liability for actions in accordance with statute); Hawaii Rev. Stat. §327 C-1 (Supp. 1979) (requires opinion of a consulting physician for brain-based determinations; provides for biennial review of subject by committee appointed by director of health); Tex. Rev. Civ. Stat. Ann. art. 4447t (Vernon Cum. Supp. 1980) (adds "no liability" provisions of AMA model bill).

²¹ Cal. Health and Safety Code §7180 (West 1975).

²² 100 *A.B.A. Ann. Rprt.* 231-232 (1978) (February 1975 Midyear Meeting).

²³ In addition to the states mentioned in the text, Ga. Code Ann.

§88-1715.1 (1979) requires "independent confirmation," provides "no liability" for good faith actions in accordance with the statute, and permits use of "other medically recognized criteria" which are not specified.

²⁴ Mont. Rev. Code Ann. § 50-22-101 (1977); Tenn. Code Ann. §53-459 (1976).

²⁵ Ill. Ann. Stat. ch. 3, §552(b) (Smith-Hurd Supp. 1975).

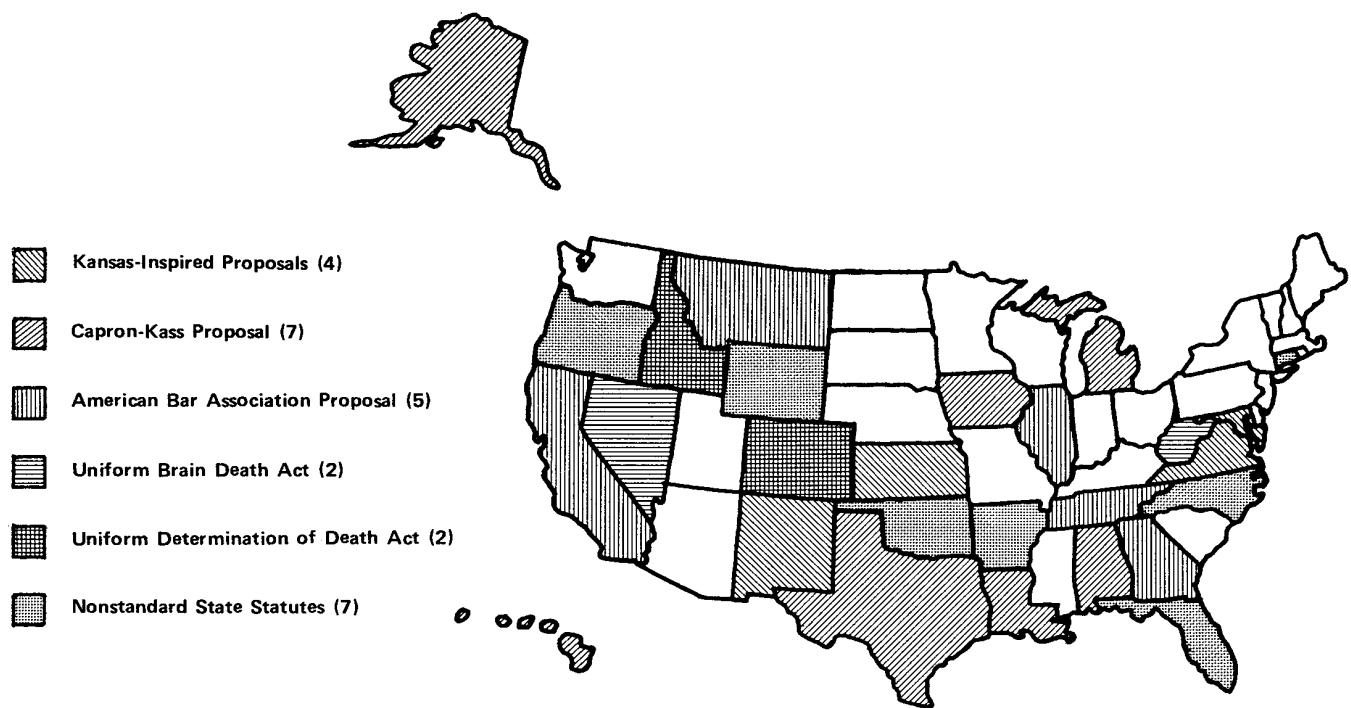


Figure 3. State Statutes on the Determination of Death

The Uniform Brain Death Act: A third model statute received the approval in 1978 of the National Conference of Commissioners on Uniform State Laws.²⁶ The Uniform Brain Death Act, adopted verbatim by Nevada,²⁷ and in part by West Virginia,²⁸ provides:

For legal and medical purposes, an individual who has sustained irreversible cessation of all functioning of the brain, including the brain stem, is dead. A determination under this section must be made in accordance with reasonable medical standards.

The American Medical Association Proposal: Most recently, the American Medical Association proposed a model bill, which no jurisdiction has yet adopted. As amended at the December 1979 Interim Meeting of the AMA, the proposal incorporated cardiopulmonary and brain-based alternatives for declaring death. Unlike most other statutes, it contained extensive provisions to limit liability for people making or taking actions pursuant to declarations as authorized by the state.

Individual State Statutes: Seven states have adopted statutes that do not closely track any of the model proposals. In 1975, Oklahoma adopted the "brain death" half of the Kansas statute, as mentioned previously, and Oregon enacted a law with alternative definitions that is much shorter than the Kansas statute.²⁹

In recent years, states have turned increasingly to nonstandard statutes. North Carolina originally adopted a rather confusing statute in 1977 incorporating both "braindeath" and "living wills" provisions.³⁰ It recently substituted a somewhat clearer statute, an amalgam of the American Bar Association and Capron-Kass approaches. Its central provision reads: "Brain death may be used as the sole basis for the determination that a person has died, particularly when brain death occurs in the presence of artificially maintained respiratory and circulatory functions."³¹

²⁶ 12 *Uniform Laws Ann.* 15 (Supp. 1981).

²⁷ Nev. Rev. Stat. §451, as amended by S.B. 5 (Laws 1979).

²⁸ W. Va. Code §16-19-1 (Supp. 1980). The West Virginia provision came as a partial amendment to an earlier statute on the Capron-Kass model, see W. Va. Code §16-19-1(c) (Cum. Supp. 1977) (adopted March 9, 1975).

²⁹ Okla. Stat. Ann. tit. 63 §1-301(g) (West 1975); Or. Rev. Stat. §146.087 (1977).

³⁰ N.C. Adv. Legis. Servo Ch. 815, § 90-320 (1977).

³¹ N.C. Gen. Stat. § 90-323, as amended by S.B. 771 (1979).

In 1979, three states enacted idiosyncratic statutes. The provisions in Arkansas³² and Connecticut³³ essentially elaborate a brain-only standard. Connecticut, like Illinois, placed its law as an amendment to the state's Uniform Anatomical Gift Act. Wyoming's law amalgamates the basic structure of the ABA model with several features of the Uniform Brain Death Act, specifically the inclusion of explicit reference to the brainstem and the replacement of "shall be considered dead" by "is dead."³⁴ Most unusually, Wyoming drew on the NCCUSL's "Comment" for additional statutory language defining brain functions as "purposeful activity of the brain as distinguished from random activity."

Finally, Florida in 1980 became the twenty-sixth state with a statutory "definition" of death.³⁵ Its statute also draws on the ABA model and Uniform Brain Death Act in only explicitly recognizing "irreversible cessation of the functioning of the entire brain," but draws on the Capron-Kass approach by implicitly acknowledging the cardiopulmonary standard. It provides that the brain-based standard is to be used 'where respiratory and circulatory functions are maintained by artificial means of support so as to preclude a determination that these functions have ceased.' The Florida statute also specifically requires that determinations of death be made by two physicians, including one specialist, and that the family be notified of the procedures used to determine death; the statute also draws on Sections 2 and 3 of the AMA model in insulating from liability those acting in accordance with its terms.

Uniform Determination of Death Act: Legislative response to the statute recommended in this Report began shortly after the President's Commission, the Uniform Law Commissioners and other sponsors of the proposal had officially acted. While this Report was being prepared, Colorado³⁶ and Idaho³⁷ (the latter in place of its existing statute) became the first states to enact the Uniform Determination of Death Act, bringing to 27 the states with statutory "definitions" of death.

³² Ark. Stat. Ann. § 82-537 and 538 (Cum. Supp. 1979).

³³ Conn. Gen. Stat. Ann. §19-139i (West Cum. Supp. 1980).

³⁴ Wyo. Stat. §35-19-101 (Cum. Supp. 1979).

³⁵ Fla. Stat. §382.085 (1980).

³⁶ Colo. Rev. Stat. §12-36-136 (1981). In a 1979 decision accepting "brain death" in a criminal case, the Colorado Supreme Court had encouraged the legislature to enact a statute. Lovato v. District Court, 601 P.2d. 1072 (Col. 1979) (*en banc*).

³⁷ Idaho Code §54-1819 (Cum. Supp. 1981) (defines "accepted medical standards" as "the usual and customary procedures of the community")

Judicial Developments: Over the past decade, courts as well as legislatures have attempted to "redefine" death. While courts adhered for a time to the traditional cardiopulmonary standards, the recent trend has been to recognize the brain-based standard, even in the absence of an explicit statute. Nonetheless, as described more fully in Appendix D, the courts have not all been willing to "update" the common law nor have their rulings established consistent standards of universal application. More fundamentally, the court cases that persistently arise hint at the uncertainty about legal standards that pervades the medical community in states without statutes.

Cases have also arisen in jurisdictions having a statute on death. The cases have mostly involved after-the-fact rulings concerning determinations of death. Generally, the statutes have been upheld by the courts, although in one case the ambiguity of the statutory language led to a "hung jury" and in another the judge refused to apply an "organ donor" statute in a nontransplant case.³⁸

The court cases have arisen in a variety of legal contexts. Some defendants charged with murder have argued that they could not be guilty of homicide because their victims were alive when physicians—who should bear the responsibility for the deaths—removed them from the respirators.³⁹ Doctors have also been sued for removing organs for transplantation from a patient declared dead on the basis of brain-oriented criteria.⁴⁰ A third category of cases has involved petitioning a court for permission to terminate life-support systems for bodies without functioning brains.⁴¹

While the courts have generally recognized brain-oriented criteria, they have often limited their rulings to the context of the particular type of case before the court, (e.g.,

³⁸ See Saundra Saperstein, "Maryland Law on Brain Death Was Unclear to Jurors," March 21, 1979, *Wash. Post*, §C at 1, col. 1; Saundra Saperstein, "Md. Nurse to be Freed of Charges: Law Defining Death Held Too Ambiguous," Mar. 29, 1979, *Wash. Post*, §B at 1, col. 6; Bacchichio v. Johnson Memorial Hospital, No. 256126 (Hartford/New Britain, Conn., Super. Ct., March 13, 1981).

³⁹ See, e.g., People v. Saldana 47 Cal. App. 3d 954, 121 Cal. Rptr. 243 (1975); State v. Brown, 8 Ore. App. 72,491 P.2d 1193 (1971).

⁴⁰ Tucker v. Lower, No. 2231 (Richmond, Va. L. & Eq. Ct., May 23, 1972).

⁴¹ 41Bacchichio v. Johnson Memorial Hospital, No., 256126 (Hartford/New Britian, Conn., Super. Ct., March 13, 1981) (judge declined officially to "update" common law "definition" of death but provided informal assurances to physicians that no liability will follow discontinuation of treatment in patient without brain functions).

explicitly stating that the precedential value of a decision is limited to criminal cases).⁴² Moreover, some of the most widely discussed cases did not reach the appellate level, limiting their actual impact to the particular court that decided them.⁴³

One case involving the question of whether a respirator-supported patient lacking all brain functions is dead or alive which reached the highest court of a state warrants particular mention because of the relationship of the court's ruling to the policy proposed in this Report. In the case of *In Re Bowman*, the Washington Supreme Court late in 1980 affirmed a lower court ruling that a person without any brain function is dead.⁴⁴ The trial court in *Bowman* had ruled that five-year-old Matthew Bowman was dead, having suffered massive physical injuries. The court enjoined the removal of the "extraordinary measures" sustaining respiration and heartbeat, however, pending an appeal. The case was set for argument before the state's highest court a week later, but the day before the argument was scheduled, all of Matthew's bodily functions ceased irretrievably. Although this event made the case moot, the court decided to rule upon the case nonetheless. The Washington Supreme Court observed in its ruling:

An electroencephalogram (EEG) gave no reading and a radionucleide scan, which shows whether blood is getting to and through the brain, found a total absence of blood flow. No cornea reflex was present and Matthew's pupils were dilated and nonreactive to any stimuli. There were also no deep tendon reflexes or other signs of brain stem action, nor responses to deep pain or signs of spontaneous breathing. Body temperature and drug intake had been controlled to avoid adverse influence on these tests. The testifying physician indicated that he believed Matthew's brain was dead under the most rigid criteria available, called the "Harvard criteria," and that his cardiovascular system would, despite the life support systems, fail in 14 to 60 days. [The physician] ... recommended that he be removed from the ventilator, a recommendation consented to by his mother.⁴⁵

The Washington Supreme Court was able to consider the model statute recommended in this Report (it had been

⁴² See, e.g., Commonwealth v. Golston, 373 Mass. 249, 366 N.E. 2d 744 (1977); State v. Johnson, 395 N.E.2d 368 (Ohio 1977).

⁴³ Tucker v. Lower, No. 2831 (Richmond, Va. L. & Eq. Ct., May 23, 1972, New York Health & Hospitals Corp. v. Sulsona, 81 Misc.2d 1002 (N.Y. Sup. Ct. 1975).

⁴⁴ *In re Bowman*, 94 Wash. 2d 407, 617 P.2d 731 (1980).

⁴⁵ *Id.* at 733.

approved by the Uniform Law Commissioners in August of 1980, in place of the Uniform Brain Death Act discussed above). The court "adopted" the provisions of the new uniform bill, while explicitly leaving to the medical profession the definition of "acceptable diagnostic tests and medical procedures... taking into account new knowledge of brain function and new diagnostic procedures."⁴⁶

International Developments: The interference of increasingly sophisticated medical technology with determining death by traditional heart-lung criteria is also a matter of concern outside the United States as well. Indeed, an international body broached the issue as early as 1968 when, a few days after the publication of the seminal Harvard criteria, the 22nd Congress of the World Medical Assembly (WMA) adopted its "Declaration of Sydney."⁴⁷ This statement, framed in general terms, recognized that, although physicians will usually be able to meet their legal responsibility in diagnosing death by relying on classical heart-lung criteria, artificial respirators and transplantation of cadaver organs posed problems for which these criteria seem insufficient. The WMA concluded that "no single technological criterion is entirely satisfactory in the present state of medicine nor can anyone technological procedure be substituted for the overall judgment of the physician." A determination of death should, the WMA declared, "be based on clinical judgment supplemented *if necessary* by a number of diagnostic aids of which the electroencephalograph is currently the most helpful."⁴⁸



The Declaration of Sydney went on to recommend that, where transplantation is involved, the determination of death should be made by two or more physicians, who must not be "immediately concerned with the performance of transplantation." This recommendation remains the most frequent common denominator in statutes found in other countries, as death is most often defined in the context of rules relating to organ transplantation.

⁴⁶ *Id.* at 738.

⁴⁷ Reprinted in "Declaration of Sydney," 2 *Med. J. Aust. Supp.* 58 (1973).

⁴⁸ *Id.*

Questions raised by the new resuscitative technology have also received some, albeit not entirely satisfactory, attention in international legal bodies. In 1976 the Parliamentary Assembly of the Council of Europe issued a "Report on the Rights of the Sick and Dying" which included a recommendation on the prolongation of life.⁴⁹ Unfortunately, the report seems to confuse patient participation in decisions about medical care with legal rules on the irreversible cessation of brain function.

In model legislation on transplantation in 1978, the Council of Europe dealt obliquely with the "definition" of death. Like the model American statute on transplantation (the Uniform Anatomical Gift Act), the European proposal did not state the basis on which death could be declared in so many words. It went somewhat further than the American provision, however, implying that cessation of brain functions is a ground for pronouncing death, at least when organs are to be removed. The 1978 Council of Europe proposal stated that "[d]eath having occurred, a removal [of organs or tissues for transplantation] may be effected even if the function of some organ other than the brain may be artificially preserved."⁵⁰

A number of countries have taken up these issues through national medical societies or law reform commissions. As a result at least 13 countries have statutes of national force and effect that allow for the determination of death based on brain-oriented criteria. At least ten countries require specific tests (usually electroencephalography and/or cerebral angiography) as part of their statutes or regulations promulgated pursuant to statutory authority.

Two countries, Canada and Australia, have a legal situation that parallels the United States; a few provinces have enacted statutes, while the others have not. In 1977 the Law Reform Commission of Australia recommended, in the context of human tissue transplants, a statute declaring death to occur upon "irreversible cessation of all functions of the brain" or "irreversible cessation of circulation of blood in the body."⁵¹ The Law Reform Commission of Canada recently proposed amending the federal "Interpretation Act" to add a brain-based "definition" to the law "for all pur-

⁴⁹ Parl. Ass.. 27th Sess. Resolution 613, adopted Jan. 29, 1976. Parl. Ass. 27th Sess. Recommendation 779, adopted Jan. 29, 1976.

⁵⁰ Council of Europe, On Harmonisation of Legislations of Member States Pertaining to Removal, Grafting and Transplantation of Human Substances, Resolution of the Committee of Ministers, 287th Sess., No. 29 (May 11, 1978) at ch. 1, art. 11, § 1.

⁵¹ Law Reform Commission of Australia, *Human Tissue Transplants* (Report No.7) Australian Government Publishing Service, Canberra (1977) at 63.

poses within the jurisdiction of the Parliament of Canada.⁵² Other countries, such as Great Britain, rely on codes of medical practice drafted by nationally recognized bodies with quasi-legal status and accepted by the relevant executive branch departments.⁵³ A recently published survey⁵⁴ the international situation identifies fifteen countries where the medical profession has officially recognized brain-based criteria in determining death in the absence of statutory or case law, and five countries where it has not, although physicians in some of these countries may in fact employ the criteria in declaring death in appropriate cases.⁵⁵

The Proposal For a Uniform Statute

The Language and Its History: The array of "model laws" and state variations reveals two major problems: first, their diversity, and second, the overly complex or inexact wording that characterizes many of them. Diversity is a problem for several reasons. In the case of enacted statutes, diversity means nonuniformity among jurisdictions. In most areas of the law, provisions that diverge from one state to the next create, at worst, inconvenience and the occasional failure of a finely honed business or personal plan to achieve its intended result. But on the subject of death, nonuniformity has a jarring effect. Of course, the diversity is really only superficial; all the enacted statutes appear to have the same intent. Yet even small differences raise the question: if the statutes all mean the same thing, why are they so varied? And it is possible to think of medical situations—and, even more freely, of legal cases that would be unlikely but not bizarre—in which the differences in statutory language *could* lead to different outcomes.⁵⁵

⁵² Law Reform Commission of Canada, *Criteria for the Determination of Death*, Report, No. 15), Minister of Supply and Service, Canada (1981).

⁵³ Working Party of the United Kingdom Health Departments, *The Removal of Cadaveric Organs for Transplantation: A Code of Practice* 11 (1979), accepting the views of the Conference of Royal Colleges and Faculties of the United Kingdom, "Diagnosis of Death," 1979(i) *Lancet* 261, and "Diagnosis of Brain Death," 1976 (ii) *Lancet* 1069-70.

⁵⁴ Frank P. Stuart, Frank J. Veith and Ronald E. Cranford, "Brain Death Laws and Patterns of Consent to Remove Organs for Transplantation from Cadavers in the United States and 28 Other Countries," 31 *Transplantation* 238 (1981).

⁵⁵ For example, the Kansas statute might be (mis)applied to declare dead a patient who still has some brain functions but who is experiencing repeated and apparently terminal respiratory difficulties, because the first paragraph of Kan. Stat. Ann. § 777-02 states that a person is dead when "Attempts at resuscitation [of respiratory and cardiac function] are considered hopeless." Disputes could arise under the Oregon statute over the propriety of a physician declaring a person dead after a severe trauma to the heart and lungs without attempting resuscitation; Or. Rev. Stat. §146.087 treats a person as alive only if "spontaneous respiration and circulatory function" can be restored.

More fundamental is the obstacle that diversity presents for the process of statutory enactment. Legislators, presented with a variety of proposals and no clear explanation of the significance of their differences, are (not surprisingly) wary of *all* the choices. Proponents of each of the models (and other critics) compounded this difficulty by objecting to the language of the other statutes along the lines discussed in the preceding section of this Chapter.

A uniform proposal that is broadly acceptable would significantly ease the enactment of good law on death throughout the United States. To that end, the Commission's Executive Director met in May 1980 with representatives of the American Bar Association, the American Medical Association and the National Conference of Commissioners on Uniform State Laws. Through a comparison of the then existing "models" with the objectives that a statute ought to serve, they arrived at a proposed Uniform Determination of Death Act:

§ 1. [*Determination of Death.*] An individual who has sustained either (1) irreversible cessation of circulatory and respiratory functions, or (2) irreversible cessation of all functions of the entire brain, including the brain stem, is dead. A determination of death must be made in accordance with accepted medical standards.

§ 2. [*Uniformity of Construction and Application.*] This act shall be applied and construed to effectuate its general purpose to make uniform the law with respect to the subject of this Act among states enacting it.

This model law has now been approved by the Uniform Law Commissioners, the ABA, and the AMA as a substitute for their previous proposals. It has also been endorsed by the American Academy of Neurology and the American Electroencephalographic Society.

Construction of the Statute: As recommended at the outset of this Chapter, the proposed statute addresses the matter of "defining" death at the level of general physiological standards rather than at the level of more abstract concepts or the level of more precise criteria and tests. The proposed statute articulates alternative standards, since in the vast majority of cases irreversible circulatory and respir-

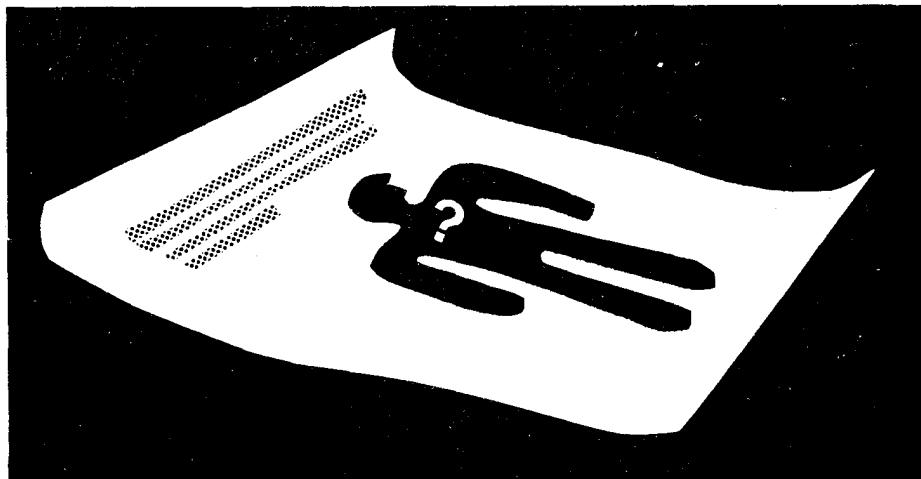
atory cessation will be the obvious and sufficient basis for diagnosing death. When a patient is not supported on a respirator, the need to evaluate brain functions does not arise. The basic statute in this area should acknowledge that fact by setting forth the basis on which death *is* determined in such cases (namely, that breathing and blood flow have ceased and cannot be restored or replaced).

It would be possible, as in the statute drafted by the Law Reform Commission of Canada, to propound the irreversible cessation of brain functions as *the* "definition" and then to permit that standard to be met not only by direct measures of brain activity but also "by the prolonged absence of spontaneous cardiac and respiratory functions."⁵⁶ Although conceptually acceptable (and vastly superior to the adoption of brain cessation as a primary standard conjoined with a nonspecific reference to other, apparently unrelated "usual and customary procedures"⁵⁷), the Canadian proposal breaks with tradition in a manner that appears to be unnecessary. For most lay people—and in all probability for most physicians as well—the permanent loss of heart and lung function (for example, in an elderly person who has died in his or her sleep) clearly manifests death. As previous chapters in this Report recount, biomedical scientists can explain the brain's particularly important-and vulnerable-role in the organism as a whole and show how temporary loss of blood flow (ischemia) becomes a permanent cessation because of the damage it inflicts on the brain. Nonetheless, most of the time people do not, and need not, go through this two-step process. Irreversible loss of circulation is recognized as death because—setting aside any mythical connotations of the heart—a person without blood flow simply cannot live. Thus, the Commission prefers to employ language which would reflect the continuity of the traditional standard and the newer, brain-based standard.

"Individual": Other aspects of the statutory language, as well as several phrases that were intentionally omitted, deserve special mention. First, the word "individual" is employed here to conform to the standard designation of a human being in the language of the uniform acts. The term "person" was not used here because it is sometimes used by the law to include a corporation. Although that particular confusion would be unlikely to arise here, the narrower term "individual" is more precise and thus avoids the possibility of confusion.

⁵⁶ Law Reform Commission of Canada, *op. cit.* at 7-20.

⁵⁷ See, e.g., Cal. Health and Safety Code §7180 (West 1975).



"Irreversible Cessation of Functions": Second, the statute emphasizes the degree of damage to the brain required for a determination of death by stating "*all* functions of the *entire* brain, *including the brain stem*" (emphasis added). This may be thought doubly redundant, but at least it should make plain the intent to *exclude* from application under the "definition" any patient who has lost only "higher" brain functions or, conversely, who maintains those functions but has suffered solely a direct injury to the brain stem which interferes with the vegetative functions of the body.

The phrase "cessation of *functions*" reflects an important choice. It stands in contrast to two other terms that have been discussed in this field: (a) "loss of activity" and (b) "destruction of the organ."

Bodily parts, and the subparts that make them up, are important for the functions they perform. Thus, detecting a loss of the ability to function is the central aim of diagnosis in this field. After an organ has lost the ability to *function* within the organism, electrical and metabolic *activity* at the level of individual cells or even groups of cells may continue for a period of time. Unless this cellular activity is organized and directed, however, it cannot contribute to the operation of the organism as a whole. Thus, cellular activity alone is irrelevant in judging whether the organism, as opposed to its components, is "dead."

At the other pole, several commentators have argued that organic *destruction* rather than cessation of functions should be the basis for declaring death.⁵⁸ They assert that until an organ has been destroyed there is always the *possibility* that it might resume functioning. The Commission

⁵⁸ Paul A. Byrne, Sean O'Reilly and Paul M. Quay, "Brain Death: An Opposing Viewpoint," 242 J.A.M.A. 1985 (1979).

has rejected this position for several reasons. Once brain cells have permanently ceased metabolizing, the body cannot regenerate them. The loss of the brain's functions precedes the destruction of the cells and liquefaction of the tissues.

Theoretically, even *destruction* of an organ does not prevent its functions from being restored. Any decision to recognize "the end" is inevitably restricted by the limits of available medical knowledge and techniques.⁵⁹ Since "irreversibility" adjusts to the times, the proposed statute can incorporate new clinical capabilities. Many patients declared dead fifty years ago because of heart failure would have not experienced an "irreversible cessation of circulatory and respiratory functions" in the hands of a modern hospital.

Finally, the argument for using "brain destruction" echoes the proposal about "putrefaction" made two centuries ago and overcome by advances in diagnostic techniques. The traditional cardiopulmonary standard relies on the vital signs as a measure of heart-lung function; the declaration of death does not await evidence of destruction. Since the evidence reviewed by the Commission indicates that brain criteria, properly applied, diagnose death as reliably as cardiopulmonary criteria, the Commission sees no reason not to use the same standards of cessation for both. The requirement of "irreversible cessation of functions" should apply to both cardiopulmonary and brain-based determinations.

"Is Dead": Most of the model statutes previously proposed state that a person meeting the statutory standards "will [or shall] be considered dead." This formulation, although probably effective in achieving the desired clarification of the place of "brain death" in the law, is somewhat disconcerting since it might be read to indicate that the law will consider someone dead who by some other, perhaps wiser, standard is not dead. The President's Commission does not endorse this view. It favors stating more directly (as had the Uniform State Law Commissioners in their 1978 proposal) that a person "is dead" when he or she meets one of the standards set forth in the statute.

⁵⁹ Already, a hand "destroyed" in an accident can be reconstructed using advanced surgical methods. The functions of the kidney can be artificially restored through extracorporeal devices; an implantable artificial heart has been tested in animals and is now proposed for human trials. It is impossible to predict what other "miracles" biomedical science may some day produce in the restoration of natural functions or their substitution through artificial means.

In declaring that an individual "is dead," physicians imply that at some moment prior to the diagnosis the individual moved from the status of "being alive" to "being dead." The Commission concurs in the view that "death should be viewed not as a process but as the event that separates the process of dying from the process of disintegration."⁶⁰ Although it assumes that each dead person became dead at some moment prior to the time of diagnosis, the statute does not specify that moment. Rather, this calculation is left to "accepted medical practices" and the law of each jurisdiction.

Determining the time of passage from living to dead can be troublesome in certain situations; like all aspects of assessing whether a body is dead, it relies heavily on the clinical skills and judgment of the person making the determination. In most cases, it appears to be the custom simply to record the time when a diagnosis of death is made as the time of death. When precision is important for legal purposes, the scientific basis for determining the time of death may be reexamined and resolved through legal proceedings.

A determination of death immediately changes the attitudes and behavior of the living toward the body that has gone from being a person to being a corpse. Discontinuation of medical care, mourning and burial are examples of customary behavior; people usually provide intimate care for living patients and identify with them, while withdrawing from contact with the dead. In ordinary circumstances, the time at which medical diagnosis causes a change in legal status should be synchronous with the time that social behaviors naturally change.

In some cases of death determined by neurologic criteria, however, it is necessary to allow for repeated testing, observation, or metabolism of drugs. This may interpose hours or even days between the actual time of death and its confirmation. Procedures for certifying time of death, like those for determining the status of being dead, will be a matter for locally "accepted medical standards," hospital rules and custom, community mores and state death certificate law. Present practice in most localities now parallels

⁶⁰ James L. Bernat, Charles M. Culver and Bernard Gert. "On the Definition and Criterion of Death," 94 *Ann. Int. Med.* 389 (1981):

If we regard death as a process then either the process starts when the person is still living, which confuses the "process of death" with the process of dying, for we all regard someone who is dying as not yet dead, or the "process of death" starts when the person is no longer alive, which confuses death with the process of disintegration.

the determination of death by cardiopulmonary criteria: death by brain criteria is certified at the time that the fact of death is established, that is, after all tests and confirmatory observation periods are complete.

When the time of "brain death" has legal importance, a best medical estimate of the actual time when all brain functions irreversibly ceased will probably be appropriate. Where this is a matter of controversy, it becomes a point to be resolved by the law of the jurisdiction. Typically, judges decide this on the basis of expert testimony—as they do with a contested determination of unwitnessed cessation of cardiopulmonary functions.

"Accepted Medical Standards": The proposed statutes variously describe the basis on which the criteria and tests actually used to diagnose death are to be selected and employed. The variations were:

Capron-Kass (1972):	"based on ordinary standards of medical practice"
ABA (1975):	"according to usual and customary standards of medical practice"
NCCUSL 1978):	"in accordance with reasonable medical standards"
AMA (1979):	"in accordance with accepted medical standards"

Despite their linguistic differences, the Capron/Kass, ABA and AMA models apparently intend the same result: to require the use of diagnostic measures and procedures that have passed the normal test of scrutiny and adoption by the biomedical community. In contrast, the 1978 Uniform proposal sounded a different note by proposing "reasonableness" as the standard. The problem is: whose reasonableness? Might lay jurors conclude that a medical practice, although generally adopted, was "unreasonable"? It would be unfair to subject a physician (and others acting pursuant to his or her instructions) to liability on the basis of an after-the-fact determination of standards if he or she had been acting in good faith and according to the norms of professional practice and belief. Even the prospect of this liability would unnecessarily disrupt orderly decision-making in this field.

The process by which a norm of medical practice becomes "accepted" varies according to the field and the type of procedure at issue. The statutory language should eliminate wholly idiosyncratic standards or the use of experimental means of diagnosis except in conjunction with ade-



quate customary procedures). On the other hand, the statute does not require a procedure to be universally adopted; it is enough if, like any medical practice which is later challenged, it has been accepted by a substantial and reputable body of medical men and women as safe and efficacious for the purpose for which it is being employed.⁶¹

The Commission has also concluded that the statute need not elaborate the legal consequences of following accepted practices. The model statute proposed earlier by the AMA contained separate sections precluding criminal and civil prosecution or liability for determinations of death made in accordance with the statute or actions taken "in good faith in reliance on a determination of death."⁶² It is not necessary to address this issue in a statute because the existing common law already eliminates such liability.

Scope of Application: The Kansas statute specified that it established when a person is considered "medically and legally dead."⁶³ Although this unnecessary language was deleted in the 1972 model statute, it partially resurfaced in the 1975 ABA proposal which begins "for all legal purposes."⁶⁴ Three years later it was back in full flower in the Uniform Brain Death Act, whose scope includes all "legal and medical purposes."⁶⁵

Besides being unnecessary, the broader provisions are misleading. A law setting a general standard without explicit limitations would be assumed to apply for *all* legal purposes; to say so in the statute, however, only raises needless questions (e.g., what does "all *legal* purposes" leave out? For example, proceedings in equity?).

By mentioning "medical purposes," the Kansas act and 1978 Uniform proposal compounded the confusion. Without this language, a statute would certainly reach the prac-

⁶¹ Edwards v. United States, 519 F.2d 1137 (5th Cir. 1975); Price v. Neyland, 320 F.2d 674 (D.C. Cir. 1963).

⁶² 243 J.A.M.A. 420 (1980) (editorial).

⁶³ Kan. Stat. Ann. §77-202 (Supp. 1971).

⁶⁴ 100 A.B.A. Ann. Rpt. 231-232 (1978) (February 1975 Midyear Meeting).

⁶⁵ Uniform Brain Death Act §1. 12 *Uniform Laws Annot.* 15 (Supp. 1980).

tice of medicine and its consequences for patients. The only additional area that might be encompassed by the phrase "medical purposes" is medical theory, a plane which a statute cannot reach whatever it may proclaim. Society cannot legislate the laws of nature, nor is there any reason to think that in this case it should want to try to do so. Thus, the language proclaiming a "definition" of death "for all medical purposes" is at best unnecessary and at worst foolish.

Finally, since the proposed statute is intended to apply in all situations, it ought not to be incorporated into a state's Uniform Anatomical Gift Act (UAGA). Placing it there would create the mistaken impression that a special "definition" of death needs to be applied to organ transplantation, which is not the case. (As a matter of fact, most of the respirator-supported cases in which the brainoriented standard would be applicable are not potential donors, as noted in Chapter 2.) Section 7(b) of the UAGA makes the time of death a matter to be determined by the attending physician; the proposed Uniform Determination of Death Act specifies the grounds on which such a determination are made. Some people have expressed concern that a determination of death in a potential organ donor might be made by a physician with a conflict of interest, but the UAGA specifies that the physician who determines that death has occurred "shall not participate in the procedures for removing or transplanting a part."⁶⁶

Personal Beliefs: Should a statute include a "conscience clause" permitting an individual (or family members, where the individual is incompetent) to specify the standard to be used for determining his or her death based upon personal or religious beliefs?⁶⁷ While sympathetic to the concerns and values that prompt this suggestion, the Commission has concluded that such a provision has no place in a statute on the determination of death. Were a non-uniform standard permitted, unfortunate and mischievous results are easily imaginable.⁶⁸

If the question were what actions (*e.g.*, termination of treatment, autopsy, removal of organs, etc.) could be taken, there might be room for such a conscience clause. Yet, as the question is one of legal *status*, on which turn the rights and interests not only of the one individual but also the

⁶⁶ Uniform Anatomical Gift Act § 7(b), 8 *Uniform Laws Annot.* 608 (1972).

⁶⁷ Veatch, *Death, Dying and the Biological Revolution*, *op. cit.* at 72-76; Michael T. Sullivan, "The Dying Person-His Plight and His Right," 8 *New Eng. L. Rev.* 197, 216 (1973).

⁶⁸ Capron, "Legal Definition of Death," *op. cit.* at 356-357.

other people and of the state itself, the subject is not one for personal (or familial) self-determination.⁶⁹

The statute specifies that death has occurred if either cardiopulmonary or brain criteria are met. Although, as a legal matter, there is no personal discretion as to the *fact* of death when either criteria is met, room remains for reasonable accommodation of personal beliefs regarding the actions to be taken once a determination of death has been made. Such actions, whether medical (*e.g.*, maintaining a dead body on a respirator until organs are removed for transplantation) or religious (*e.g.*, withholding religious pronouncement of death until the blood has ceased flowing), can vary with the circumstances. Some subjects in the Commission's hospital survey, for example, were maintained on ventilators for several hours after they were dead, in deference to family wishes or in order for the family to decide whether to donate the deceased's organs.

Ethical Aspects of the Proposal

In addition to the issues discussed earlier, particularly in Chapter Three, two further ethical issues deserve mention: (a) concerns about the certainty of diagnosis and (b) concerns about the medical steps that may be taken after death is pronounced.

Certainty of Diagnosis: Part of the public concern over employing a brain-based standard to determine death seems to arise from fear that this may cause medical treatment to be withdrawn from some patients who might have "recovered," that is, regained consciousness or at least the ability to breathe without the aid of a respirator. This fear is ex-

⁶⁹ Physicians have recognized the need for sensitivity and good communication on this point:

Before and during the diagnostic evaluation of brain death, the patient's family is informed not only of the patient's medical condition but also of the concept of brain death, its diagnosis, and the consequences of death certification in these cases. Because the declaration of death is the legal responsibility of the medical practitioner, the family's permission for this procedure is not sought but their questions and concerns must be answered honestly and with the necessary education and communication regarding the events following discontinuation of cardiopulmonary support.... When transplantation is not planned, family members may request to be at the bedside when the ventilator is removed. This is permitted but the family is advised that peripheral muscle movements may be observed during the ensuing anoxia and that these are not dependent on remaining brain function.

David J. Pawner & Ake Grenvik, "Triage in Patient Care: From Expected Recovery to Brain Death," 8 *Heart & Lung* 1103, 1107 (1979).

pressed in anecdotes about patients who have resumed normal lives after long periods of coma or even after having been pronounced dead.⁷⁰ The ethical question is whether a new, brain-oriented definition of death would lead to abandonment of patients who might have responded to continued medical care. Those who press this objection to "redefinition" of death insist that death should not be pronounced until it is certain that recovery is impossible.⁷¹

The moral gravity of the concern over premature cessation of care cannot be questioned. It is important, however, to be clear on the relation of this Concern to the proposed brain-oriented standard. Under that standard, death will be pronounced in cases in which there is an irreversible loss of brain functions while respiration is artificially supplied. Such bodies might have been regarded as alive if only heart-lung tests for death were permissible. Yet ethical concern over the accuracy of the criteria used to establish a standard and the certainty of the resulting diagnosis can be expressed about both standards—brain or heart-lung—or indeed about any standard. The certainty issue, then, is not peculiar to a brain-oriented standard.

It is true that public attention has not recently focused on the certainty of the diagnosis of death under the heart-lung formulation. But this has not always been so. From time to time in centuries past, the public questioned the ability of doctors to determine when a person had suffered irreversible cessation of life functions. Writers were able to excite the public imagination with tales of buried people awakening and escaping from coffins.⁷² The prospect of premature burial has been eliminated by the practice of embalming. Increased public confidence in the diagnostic ability of physicians has laid the remaining fears largely to rest, although reports of occasional "mistakes" (for example, by paramedics in battle) continue to circulate.

The ethical concern over certainty, then, is addressed to a relatively narrow and technical question: with what assurance can a physician state that the relevant organs will

⁷⁰ Bethia S. Currie, "The Redefinition of Death," in S.F. Spieker (ed.) *Organism, Medicine, and Metaphysics*, D. Reidel Publishing Co., Dordrecht, Holland (1978) at 177, 184-191. Review of the cases cited established that in none was a patient who subsequently recovered spontaneous functioning ever dead according to the standard of "irreversible cessation of all functions of the brain" or by the detailed medical guidelines set forth in Appendix F to this Report.

⁷¹ Bryne, O'Reilly & Quay, *op. cit.*

⁷² See pp. 13-15 *supra*; Edgar Allan Poe, "Fall of the House of Usher," David Galloway (ed.) *Edgar Allan Poe: Selected Writings*, Penguin Books, New York (1979) at 138.

not resume functioning in a person diagnosed to have lost certain vital functions? This question cannot be answered by any moral or philosophical argument; it requires empirical evidence. Since experts testified before the Commission that determinations of death based on the irreversible cessation of total brain functioning are today no more, and perhaps less, subject to error than those based on irreversible cessation of heart and lung functions, this ethical question can be satisfactorily answered: a statute establishing a whole-brain standard for determining death would not lead to an increase in the number of patients declared dead who actually possessed the capacity for recovery. Both standards contained in the proposed statute provide the basis for accurate and reliable determinations, when proper criteria and tests are used with due care by qualified people.

Terminating Medical Interventions on Dead Bodies: A patient correctly diagnosed as having lost brain functions permanently and totally will never regain consciousness. He or she will experience no pleasure or pain, enjoy no social interaction, and be unable to pursue or complete his or her life's projects. Why, then, is there an ethical issue over discontinuing medical interventions? For many, there will be none. As with all dead bodies, it is appropriate to discontinue interventions—indeed, it is usually inappropriate, on both practical and moral grounds, to continue to intervene,⁷³ except under closely circumscribed conditions (as when a dead person's organs are kept functioning briefly while preparations for organ removal and transplantation are completed.)

For some people, however, the withdrawal of treatment from a mechanically respirated patient diagnosed as dead because of loss of all brain functions is difficult and perhaps ethically questionable. Such corpses after all, typically have some appearance of life, such as a moving chest, pulsing blood vessels, and bodily warmth. It is these factors, of course, that make the status of such bodies ambiguous and present the issues for biomedical professionals and the public discussed in this Report.

Ceasing to intervene medically in such cases should be compared with the appropriate behavior in regard to other dead bodies. For example, medical personnel may labor vigorously over a patient with a cardiac arrest. If they are

⁷³ Cf. Markku Kaste, Matti Hillbom & Jorma Palo, "Diagnosis and Management of Brain Death," 1 *Brit. Med J.* 525, 527 (1979): "As soon as it is obvious that the patient cannot recover, lifesupporting measures should perhaps be withdrawn, since continued support may increase reluctance to embark on resuscitative measures generally."

not able to restore spontaneous circulation, they know that the patient is dead and treatment ceases.

The use of the respirator—and the decision to withdraw it from a patient who has been declared dead on the basis of an irreversible cessation of all brain functions—only appears to be different. The superficial difference arises because of differences in the clinical situations. An attempt at cardiac resuscitation is acute and dramatic (typically involving numerous people who labor vigorously, shouting orders and employing ever more Draconian measures). By comparison, an attempt at brain resuscitation is chronic (taking hours or days, not minutes) and typically peaceful (the loudest noise may be the quiet "woosh" of air from a mechanical respirator and the rhythmic beeping of a cardiac monitor). At the moment of cardiac failure, one can almost see the life pass from a patient, while from the other it has slipped away so stealthily that its image lingers on. Although undeniably disconcerting for many people, the confusion created in personal perception by a determination of "brain death" does not, in the Commission's view, provide a basis for an ethical objection to discontinuing medical measures on these dead bodies any more than on other dead bodies.

Indeed, it is quite important to be clear on this matter because of the attention paid in recent years to the ethical issues in decisions to forego treatment of *dying*—but still living—patients. That is a separate issue, and one which the Commission will address in a subsequent report. Mechanical respirators and associated treatments are applied to two groups of patients: those whom they are helping to keep alive and those who have died despite such treatment. Failure to recognize the distinctness of those two situations will only obscure and exaggerate the difficulties of framing policy. The statute recommended in this Report aids in that process of recognition by providing a legal standard to distinguish the dead from the dying.

Defining Death

Appendices

Appendix A:

Glossary of Terms

Appendix B:

Studies of Outcome in Comatose, Artificially-
Respirated Patients

Appendix C:

Statutes on the Determination of Death

I: Analysis of Statutes

II: Model Legislation

III: State Legislation Adopted 1970-1981

Appendix D:

Judicial Developments in the Definition of Death

Appendix E:

International Rules

Appendix F:

Guidelines for the Determination of Death

These documents are attachments to the Report and were not formally adopted by the Commission. Appendices A – E were prepared by the staff and Appendix F is a statement endorsed by a group of medical consultants to the Commission.

Glossary of Terms

A

Anoxia is the absence of oxygen supply to the tissues.

Apnea denotes an absence of the impulse to breathe which leads to an inability to breathe spontaneously.

Asystole is the absence of contraction (systole) of the heart. Cephalic reflexes require some intact brainstem. Most important in the discussion of "brain death" issues are the light reflex (constricting the pupils when a light is shined in the eyes), the corneal reflex (blinking when the cornea is touched), the oculocephalic reflex or doll's head reflex (maintaining the position of the eyes when the head is turned), and the vestibular reflex (turning of the eyes when an ear is irrigated with cold liquid).

Hypoxia is the reduction of oxygen supply to the tissues below physiologic levels.

Infarction is a localized area of necrosis in response to ischemia.

Irreversible coma has been used by some authors as a synonym for persistent vegetative state and by others as a synonym for brain death. Although a patient without any brain functions on respirator support may still appear to be in a deep sleep, by generally accepted medical criteria such a patient would not be in a coma or any other living state. Nevertheless, the term is used as an umbrella term for a variety of comatose states including brain death, persistent vegetative state, and locked-in state (consciousness without movement).

Ischemia denotes a loss of blood supply to a tissue, and thus includes not only hypoxia or anoxia but deprivation of nutrients and waste accumulation.

Necrosis is the mortification of cells or tissue.

Persistent vegetative state or persistent noncognitive state describes a syndrome of diverse etiologies including cerebral, cortical, or brainstem lesions. Patients in this condition are often described as awake but not aware: they often can breathe, chew, swallow and even groan but show no signs of consciousness, perception, cognition, or other higher functions.

Spinal reflexes, which include the knee jerk, ankle jerk, and so forth, require an intact spinal cord segment but not an intact brainstem. A person in deep coma and a person whose entire brain is dead may both have spinal reflexes.

Systolic blood pressure is the force of the blood in a major artery at the time of maximum force, resulting from cardiac contraction (systole).

Studies of Outcome in Comatose, Artificially- Respirated Patients

B

The mechanical respirator is a life-saving technology, facilitating the recovery of patients whose capacity for spontaneous respiration is temporarily lost or seriously impaired. But not all patients receiving respirator support recover; the technology also generates medico-legal dilemmas.

The Commission was unable to locate any data on the number of patients who have permanently lost all brain functions, despite ventilator-maintained respiration and circulation, or on the relative proportion of this and other outcomes among comatose patients receiving respirator support. Although time and budget constraints prevented the Commission from embarking on a large-scale study which would yield national statistics or widely generalizable data, several small hospital surveys were commenced in the fall of 1980 to shed some light on the implications of respirator use.

Methodology

The Commission's work had two components: in part I, the Commission arranged for a retrospective review of medical records at four hospitals; in part II, the Commission made use of three existing computerized data bases collected for purposes independent of the Commission's work. The data bases in Part II included four hospitals, none of which were included in Part I. In both parts of the Commission's study, the same entrance criteria were applied, namely coma¹ for at least six hours and simultaneous respirator

¹Coma was defined as inability to 1) open the eyes, 2) obey verbal commands and 3) utter recognizable words, (*i.e.*, maximum scores of 1-5-1 on the Glasgow Coma Scale). G. Teasdale and B. Jennett "Assessment of Coma and Impaired Consciousness. A Practical Scale," 2 *Lancet* 81 (1974).

support. A detailed description of the methodology for each portion of the study follows.

Part I: Record Review

The Commission arranged for investigators at four acute care hospitals² (hereafter referred to as Centers 1-4) to review the medical records of comatose patients who received respirator assistance during a two-month period in 1980. The centers were not selected randomly and are not "representative" of the range of hospitals in the United States. On the contrary, they were chosen because there were likely to be more cases of coma with respirator support at this type of hospital and, therefore, the attendant medico-legal issues were especially likely to arise. Among the reasons for selecting the particular hospitals were: a reasonable number of cases could be expected because these centers were acute care facilities in large metropolitan areas; the medical records were likely to contain information which the Commission sought; participating neurologists at the institutions were knowledgeable about the use of brain-based criteria for diagnosing death; and the centers were geographically dispersed. Table 1 presents an overview of Centers 1 – 4.

Table 1:

Overview of Centers in Part I (Record Review)

		N umber of Patients	N umber of
	Approximate	Receiving Respirator	Patients Meeting
Center	Number Beds	Support 4/1/80-5/31/80	Study Criteria
1	350	99	30
2	425	121	35
3	900	242	36
4	850	152	32

Medical records were reviewed in the following way: Each investigator obtained a list of patients over one year of age who had received respirator assistance at his or her center between April 1, 1980 and May 31, 1980. The patient records were then screened to determine which patients met the entrance criteria, namely coma for at least six hours and simultaneous respirator assistance during the two-month period. The record of each subject who met the entrance criteria was then reviewed to determine whether 30 days after meeting the criteria the subject had died, was discharged or remained in the hospital. The condition of patients who remained in the hospital 30 days after onset of coma and respirator support was abstracted from the chart,

² One of the four hospitals actually includes two facilities: a center primarily serving adults and an associated children's hospital.

as was the discharge diagnosis of those who left the hospital within the month. Any subject who died after having been discharged was to be included as a discharge, not a death. Additional information about the neurological status and medical management of those who died and their organ donor status was also obtained. The questionnaire used in the study is reprinted at pages 102-05 of this appendix.

The research review committee at each of the participating centers gave prior approval to the study. Confidentiality of the subjects was preserved.

Part II: Computerized Data Bases

The second part of the Commission's empirical work involved secondary analysis on the following existing computerized data bases on critically ill patients: (1) all patients with severe head trauma between April 1979 and March 1980 at an acute care center in a large metropolitan area (hereafter Center A); (2) all patients in deep coma of *nontraumatic* origin between April 1976 and March 1977 at Center A and at a university-based tertiary care facility (hereafter Center B); (3) all patients admitted to the Intensive Care Unit between April 1979 and March 1980 at a second university-based hospital that provides both acute and tertiary care (hereafter Center C). Center C is not the primary trauma center in its locale and thus the majority of its coma cases are of nontraumatic origin.

Investigators responsible for the data bases determined which of their patients met the criteria of coma and simultaneous respirator assistance during the year indicated. The type of data solicited about subjects at Centers A, B and C is shown on the forms at pages 106 -07 of this appendix. The information requested was not uniformly available from each of these centers.

The data available on head *trauma* subjects at Center A included: the one-month and six-month status of subjects; the number and management of patients who met neurologic criteria for death (irreversible cessation of all functions of the entire brain, including the brainstem); and whether those declared dead on the basis of such criteria were organ donors.³

Less complete information was available on subjects in coma of *nontraumatic* origin at Centers A and B. The one-month and six-month status of subjects in this data base was provided to the Commission. No data on the number of subjects meeting neurologic (i.e. brain-based) criteria were available.

At Center C, the one-month outcome of subjects meeting the Commission study criteria was available. The

³ Some of these data were obtained by also reviewing medical records of subjects identified in the computerized data base.

neurologic status, medical management and organ donor status of subjects was available on about two-thirds of the subjects who died; the charts on the remaining dead subjects were not available.

Because some data from Centers A, Band C were not available, not all centers are represented in each of the analyses presented.

RESULTS

Hospitals 1 – 4 in the record review ranged in size from 350 to 900 beds, and the total number of patients receiving respirator support (both comatose and not comatose patients) varied with the size of the facility. The number meeting the study criteria of coma and simultaneous respirator support was very similar at each of the four centers, however, ranging from 30 to 36 patients (Table 1). The results from the four centers are aggregated in some of the analyses that follow.

A description of the subjects in Parts I and II of the study is provided in Table 2. A total of 133 subjects met the study criteria at Centers 1 – 4 in Part I of the study, 93 of these with coma of nontraumatic origin and 40 with a traumatic coma. In Part II, there were 79 patients in the severe head injury data base at Center A who were entered in the study; 57 subjects in the nontraumatic data base from Centers A & B; and 47 subjects at Center C who met the study criteria.

1. Status of subjects one and six months after entering study

Table 3 presents the functional categories of the 133 patients at Centers 1 – 4 one month after being entered in the study. About two-thirds (89/133) of all subjects at Centers 1 – 4 were dead within one month of the onset of coma with respirator support. Among the 40 survivors⁴ were eight subjects in a persistent vegetative state (PVS) and 16 who suffered severe disability at the end of the month. The remaining 16 survivors—12 percent of all subjects—achieved a good to moderate recovery within 30 days. Those who achieved a good outcome were usually in a coma due to drug intoxication. The overall rates convey the experience with comatose respirator-assisted patients at the acute care hospitals. The mortality rate of a population of comatose, respirator-supported patients depends, in part, however, on the relative proportion of patients with various types of nontraumatic causes of coma and those in coma resulting from a severe head injury. The results from Centers 1 – 4 broken down by type of coma (nontraumatic/traumatic) and the data from the specialized data bases in Part II of the

⁴ The one-month outcome of four subjects discharged within three weeks of entering the study is not known.

Table 2:
Subjects in Part I and Part II

	Type of Center/Sample	Dates	Number of Subjects	Etiology of Coma			Total Deaths		Total Deaths that Occurred According to Neurologic Criteria	No. Deaths Declared by Neurological Criteria
				Trauma	Nontrauma	Unknown	1 mo.	6 mo.		
Part I: Record review	4 acute care hospitals	4/1/80-5/31/80	133	40	93	--	89	unk.	23	12
Part II: Computerized data bases										
Center A	severe head trauma	4/79-4/80	79	79	--	--	46	50	11	10
Centers A & B	nontraumatic coma	4/76-4/77	57	--	57	--	42	46	unk.	unk.
Center C	ICU data base	4/79-4/80	47	6	35	6	42 ^{a/}	unk.	b/	b/

a/ Of the 42 deaths, 33 were among those with nontraumatic coma; 4 with traumatic coma; and in 5 cases the etiology is unknown.

b/ Data were available on only 26 of the 42 subjects who died; of these 26, there were 14 who met neurologic criteria, all of whom were declared dead on that basis.

Table 3:
Functional Status of Subjects at Centers 1 – 4 One Month After Entering Study^{a/}

	Trauma	Nontrauma	All Cases
	(40)	(93)	(133)
Dead	17 (42.5%)	72 (77.4%)	89 (66.9%)
Persistent Vegetative State	4 (10.0)	4 (4.3)	8 (6.0)
Severe Disability	9 (22.5)	7 (7.5)	16 (12.0)
Moderate Disability	2 (5.0)	1 (1.0)	3 (2.2)
Mild Disability	4 (10.0)	0	4 (3.0)
Good Recovery	2 (5.0)	7 (7.5)	9 (6.7)
Unknown	2 (5.0)^{b/}	2 (2.1)^{c/}	4 (3.0)

- a/ Table includes patients who died in hospital, remained hospitalized at the end of the 30-day follow-up period and who were discharged within 30 days. This latter group are reported as follows: discharge diagnosis was used if patient was discharged between day 22 and day 30 of the follow-up period; patients discharged within the 30 day period with normal function are included under "good recovery", 1 patient discharged with mild disability 12 days after entry (had mild disability 3 months later) is included as mild disability; all other discharges are called "unknown" outcome and additional information, when available, is provided in the footnotes.
- b/ One patient discharged to another hospital in a PVS. considered "terminal" 8 days after meeting criteria; one patient with moderate disability 16 days after entry (had mild disability 7 months later).
- c/ One patient discharged to another hospital "in coma, no response to pain," 6 days after meeting criteria; one patient discharged with moderate disability 1 week after meeting criteria.

study provide more detailed information about the relative proportion of comatose patients who recovered and who died following respiratory support.

a. Nontraumatic

About 75 percent of subjects in coma of nontraumatic origin at Centers 1 – 4 and at Centers A & B died within a month (Table 2). Centers A & B, however, exclude comas caused by drugs. Eliminating drug cases—which tended to recover—from analysis of the data from Centers 1 – 4, the mortality rate was about 80%. The one-month mortality among the 35 nontraumatic coma patients exclusive of drug-induced comas at Center C was 94% (Table 2).

The functional status at six months of the 15 subjects who were alive one month after onset of a coma of nontraumatic origin and respirator support at Centers A & B are shown in Table 4. In six months almost all subjects in a persistent vegetative state or severely disabled had died, while those with better one-month outcomes generally stayed the same or improved. The six-month status of only one of the

two nontraumatic coma survivors at Center C is known; a PVS patient at one month remained in that state at six months.

b. Traumatic

About 40 percent of trauma patients at Centers 1 B 4 died within a month (Table 3). Mortality among traumatic coma patients at Center A was higher—58 percent at one month and 63 percent at six months (Table 2). Age is a significant factor in the outcome of coma resulting from a head injury and the older age of patients at Center A may well explain the increased mortality. Table 5 shows the functional status at six months of the 33 subjects at Center A who were alive one month after onset of traumatic coma and artificial respiration. Most subjects remained in the same functional category or improved slightly at six months. One-month and six-month mortality rates of traumatic coma subjects at Center C were not calculated separately since there were only six such subjects and data about them were limited.

2. Neurologic deaths and declarations of death

In the Part I record review, between five and seven subjects each center met brain-based criteria of death over the two-month period.⁵ The total of 23 such subjects at the four centers represents one-quarter of the 89 subjects who died, and 17 percent of the 133 comatose, respirator-supported subjects in Part I of the study. During April, May and June of the year under study, the total number of hospital deaths in the four centers was 453, or an estimated 299 per two-month period. The ratio of patients with irreversible cessation of total brain functions within 30 days of onset of respirator-assisted coma to total hospital deaths is thus 23/299 or eight percent.

Centers 1 B 4 differed markedly in the extent to which brain-based criteria were used to declare death (Table 6). Every time a subject at Center 2 suffered irreversible cessation of brain functions, death was declared on that basis. In contrast, at Center 4 such subjects were never declared dead until the cardiopulmonary standard was met.

In Part II (Table 2), records from Center A on the 46 traumatic coma subjects who died showed that 11 (24 percent) fulfilled brain-based criteria prior to cardiac standstill. In all but one case, death was declared on that basis and support of the body was discontinued. Data were avail-

⁵ A chart review of this sort is dependent on the notes in the medical record being sufficiently complete to document a retrospective diagnosis. The neurologists abstracting data for the study at each center categorized a subject as having been "brain dead," if 1) the chart specifically stated that "brain death" had occurred, and/or 2) on the basis of the chart notes the neurologist concluded that an irreversible loss of all brain functions had occurred.

Table 4:
One Month and Six Month Outcome of Nontraumatic Coma at Centers A and B

		Six Month Outcome				
		Death (50)	PVS (0)	Severe Disability (0)	Moderate Disability (2)	Good Recovery (5)
One Month Outcome	Death (42)	42				
	PVS (4)	4				
	Severe Disability (4)	3			1	
	Moderate Disability (3)				1	2
	Good Recovery (4)	1				3

Cases on the dashed line showed no change;
those above improved, below worsened.

able on 26 of the 42 subjects at Center C who died. Fourteen of these 26 subjects met brain-based criteria and in all cases death was declared on that basis and support discontinued. Data on the number of nontraumatic coma subjects at Centers A & B who suffered irreversible cessation of all brain functions were unavailable. All subjects in the Commission's study who met brain-based criteria, but were maintained on respirators and not declared dead by these criteria, subsequently met cardiopulmonary criteria of death.

The determination that a subject had suffered a permanent loss of all brain functions did not always—or even usually—trigger *immediate* termination of support and declaration of death. The amount of time support was continued after a diagnosis of irreversible loss of all brain functions varied considerably among, and in some cases within, centers. At Center A, for example, where ICU beds are scarce, respirators were consistently disconnected from dead bodies as soon as the family was apprised of the determination. This often occurred in less than an hour and, with one exception, within a few hours after the determination had been made, which itself followed a period of vigorous medical support of hours or even days. In the one ex-

Table 5:
One Month and Six Month Outcome of Traumatic Coma at Center A

		Six Month Outcome					Unknown (1)
		Death (50)	PVS (0)	Severe Disability (12)	Moderate Disability (5)	Good Recovery (11)	
One Month Outcome	Death (46)	46					
	PVS (4)	2		2			
	Severe Disability (17)	2		10	5		
	Moderate Disability (8)					7	1
	Good Recovery (4)						
	Unknown (0)						

Cases on the dashed line showed no change;
those above improved, below worsened.

ceptional case, respirator support was continued for 12 hours after death occurred while the family attempted to decide whether to donate the deceased's organs. After 12 hours the family had still not reached a decision and the need for the ICU bed led the physicians to discontinue support. In contrast, at Center C, several dead bodies were maintained on respirators for 24, 48, and in one case 72 hours, before death was declared on the basis of brain criteria. As a general practice, families at participating centers were consulted before death was declared and support terminated.

3. Organ donation and use of brain-based criteria

The use of neurologic criteria has been linked in popular understanding with organ transplantation.⁶ Data were obtained from centers in the Commission's study, to ascertain whether organ donation was the primary reason for use of brain criteria. Of the 36 subjects found by the study to have been *declared* dead on the basis of neurologic criteria, only six were organ donors; in the vast majority of cases brain criteria were applied independently of organ donation considerations.

⁶ Peter McL. Black, "Brain Death II" 299 J.A.M.A. 393, 396 (1978); "Are Some Patients Being Done In?" 116 Time 54 (1980).

Table 6:
Use of Brain-Based Criteria at Centers 1 – 4

Center	Number of subjects	Number who died in hospital within 30 days	Number who met brain-based criteria ^a	Number who met criteria who were declared dead on that basis
1	30	16 (53.3%)	6 (20% of sample) (37.5% of dead)	5 (83.3% of those who met brain-based criteria)
2	35	25 (71.4)	5 (14.3) (20.)	5 (100)
3	36	23 (63.9)	5 (13.9) (21.7)	2 (40)
4	32	25 (78.1)	7 (21.9) (28.)	0 (0)
total all centers	133	89 (66.9)	23 (17.3) (25.8)	12 (52.2)

a. Either as reported in chart or on basis of abstractors' review of notes.

At centers 2 – 4 official criteria at that hospital was applied; at center 1 where no official criteria exist the neurologist reviewing charts made the determination.

Discussion

The Commission's study provides data on several questions relating to the role of respirators and the incidence and medical management of respirator-supported comatose patients who irreversibly lose all brain functions. Discussion of the Commission's findings are organized around the following questions:

- 1) What are the relative proportions of comatose, respirator-supported patients who survive and who die?
- 2) What proportion of comatose, respirated patients experience an irreversible cessation of all brain functions?
- 3) What actions are taken when a patient is found to have permanently lost all brain functions?
- 4) What proportion of patients declared dead by brain-based criteria are organ donors?

1. What are the relative proportions of comatose, respirator-supported patients who survive and who die?

Death, and specifically death determined by brain-based criteria, is a common outcome among comatose, respirator-supported patients. In some cases in which respirator support is provided to comatose patients, however, the patient survives, sometimes in a persistent vegetative

state or with another severe disability and other times with less serious or no residual damage. In the Commission's study, about two-thirds of the 133 subjects (in traumatic and nontraumatic coma) at Centers 1 - 4 died within a month. At the other end of the spectrum, about 12 percent of the subjects achieved a good to moderate recovery.⁷

The cause of coma, early clinical signs and, at least in the case of traumatic coma, the age of the victim affect the patient's prognosis. About 20 percent of subjects in coma due to nontraumatic causes survived one month after onset of coma and respiratory support. The progress reported at one month appears to be a meaningful indicator of longer term outcome. Levy *et al.* found that patients in coma of nontraumatic origin who survived for one year made most of their improvement during the first month.⁸ Most patients in their series of 500 nontraumatic coma patients who were alive one year after onset of coma were in the same functional category as at one month; some improved slightly.

Unlike nontraumatic coma, in which one-month status is a strong predictor of longer term outcome, the six month status of traumatic coma patients is a much better indicator of longer term outcome. Heiden *et al.* report that of 184 patients who survived for a year, 90 percent achieved their best outcome by six months.⁹ At Center A about 40 percent of the comatose respirator-assisted subjects survived six months; however, 12 of those 29 survivors were in a persistent vegetative state or severely disabled.

2. What proportion of comatose, respirated patients experience an irreversible cessation of all brain functions?

At each of the four acute care hospitals in Part I of the Commission's study, 2 - 4 cases of permanent loss of all brain functions occurred each month among patients receiving aggressive medical support (including artificial respiration) for comas of traumatic and nontraumatic origin. It is interesting to note that the proportion of

⁷ Although the study was not designed to test the accuracy of the brain-based criteria for determining death but rather to assess the outcome of respirator support for a range of comatose patients, it bears noting that none of the subjects who survived ever met those criteria.

⁸ David E. Levy, David Bates, John J. Caronna, Niall E.F. Cartlidge, Robin P. Knill-Jones, Robert H. Lapinski, Burton H. Singer, David A. Shaw and Fred Plum, "Prognosis in Nontraumatic Coma," 94 *Ann. Int. Med.* 293 (1981). This series includes 57 subjects in the Commission's study.

⁹ James S. Heiden, Richard Small, William Caton, Martin H. Weiss and Theodore Kurze, "Severe Head Injury and Outcome: A Prospective Study," in A.J. Popp et al. (ed.) *Neural Trauma* Raven Press, New York (1979).

respirator-supported comatose patients who suffered neurologic death was similar (about 15 percent) at each center. The incidence of 2 – 4 cases per month is consistent with a report by Grenvik *et al.* of 48 cases of "brain death" over a two-year period at Presbyterian-University Hospital in Pittsburgh.¹⁰ Although the data available on the incidence of "brain death" are from only five hospitals, the recurring finding of 2 – 4 cases per month is suggestive of the frequency with which these cases may be expected to arise at acute care centers in major metropolitan areas.

The Commission's investigations focused on respirator-assisted comatose patients—the population in which it is possible to meet brain-based criteria prior to fulfilling cardiopulmonary criteria of death. Even among this population, most fulfilled the cardiopulmonary standard for declaring death before a diagnosis of irreversible loss of all brain functions was or could have been made. The 23 cases of neurologic death at Centers 1 – 4 comprised only one-fourth of the 89 deaths among respirator-supported comatose patients. Similarly, among subjects with traumatic injury at Center A, brain-based criteria were met in only one-fourth of the deaths. Clearly, cardiopulmonary criteria remain the predominant basis for determining that death has occurred, even in patients on respirators.

The number of deaths diagnosed by neurologic as compared to cardiopulmonary criteria can reflect medical management decisions. For example, a patient who might have met brain-based criteria while on a mechanical respirator will instead be declared dead on cardiopulmonary grounds if artificial support is not initiated or maintained. A few such instances occurred in the Commission's study.

Another factor affecting the relative proportion of deaths declared by cardiopulmonary criteria and neurologic criteria is the systemic condition of the subjects receiving support. Older patients, for example, are more likely to succumb to cardiac standstill before suffering an irreversible loss of all brain functions because, in general, their systems are weaker and more difficult to maintain. In some cases in the study an initial diagnosis of loss of brain functions was made, but before that determination could be confirmed, cardiac standstill intervened, despite mechanical respiration.

¹⁰ Ake Grenvik, David J. Pawner, James V. Snyder, Michael S. Jastremski, Ralph A. Babcock and Micheal Loughhead, "Cessation of Therapy in Terminal Illness and Brain Death," 6 *Critical Care Med.* 284 (1978).

3. What actions are taken when a patient is found to have permanently lost all brain functions?

The Commission's data illustrate the wide variation in the extent to which brain-based criteria are used to *declare* death when irreversible loss of all brain functions occurs. One center declared all subjects who met brain-based criteria dead and discontinued support, while another always supported such bodies until cardiac arrest. Practice at other centers fell between these extremes: Sometimes a body without brain functions was supported and sometimes such a body was declared dead and support discontinued.

Some of the disparities in use of neurologic criteria within and among centers may reflect variations in knowledge about and/or acceptance of the brain-based standard by physicians and the public. Since the practical consequence of failing to cease treatment and pronounce death when brain functions cease irreversibly is support of a dead body for a brief period (usually less than a week) until cardiac standstill occurs, evaluation of whether such continued treatment is a major problem or, on the other hand, not a matter of concern at all probably varies from individual to individual.

Incentives to make an appropriate diagnosis and declare death do not always seem compelling when professional or public understanding is lacking. A climate of public acceptance of the neurologic basis for determining death, general legal adoption of that standard, and medical recognition of the social and legal acceptance as well as of a unified set of reliable medical criteria should result in more consistent management of dead bodies.

4. What proportion of patients declared dead by brain-based criteria are organ donors?

Clearly, advances in organ transplantation were a major impetus in the early development of brain-based criteria for death. Nevertheless, the Commission's findings that only six of 36 subjects in the Commission's surveys who were declared dead by neurologic criteria were organ donors illustrates that the criteria are being applied primarily outside the context of organ donation. Indeed, considerations such as respect for the dead and a desire to make scarce resources available to those whom they might benefit are today more important incentives for the use of brain-based criteria when traditional criteria for determining death cannot be applied.

Questionnaire for Record Review at Centers 1-4

Hospital _____ Abstracter _____

Subject Number _____

Part I

1. Date of Birth: _____

2. Sex: female male

3. Race: (if available)

White American Indian Hispanic Asian

Black Other, please specify _____

not reported in chart

4. Date of Entry into Study: _____

5. Is this the second time this patient has entered the study (i.e. did the subject first meet the entrance criteria more than 30 days previously)?

Yes (previous subject number _____) No

6. Score on Glasgow Coma Scale: (see attachment)

Indicate the score at the time patient entered study. (Note entrance criteria is a maximum of 1-5-1 on the eye opening, motor response and verbal response scores respectively)

eye opening motor response verbal response _____

7. Brainstem Reflexes:

Indicate whether the following brainstem reflexes were present or absent at the time the patient met the entrance criteria. If the information is not available in the chart, check "unknown."

	Present	Absent	Unknown
a) pupillary	____	____	____
b) corneal	____	____	____
c) doll's eye movement	____	____	____
d) calorics	____	____	____
e) spontaneous respirations	____	____	____
f) other: Please specify			

8. Etiology of Coma: (Mark most appropriate response)

cardio respiratory (e.g., cardiac arrest, hypovolemic shock)

subarachnoid hemorrhage

cerebrovascular

hepatic

metabolic

CNS infection

drugs

trauma

other: Please specify _____

Describe any unusual circumstances

9. **Last Date of 30-day Follow-up Period** (i. e. date 30 days after date entered in question 4): _____

.0. **Readmission to Participating Hospital During Follow-up Period:**

Complete this question only if the subject was discharged and readmitted to the participating hospital (whether or not they again meet the entrance criteria) during the 30-day follow-up period.

a) date of discharge: _____

b) date of readmission: _____

c) was readmission related to condition leading to entry into the study?

yes no

Please explain _____

11. **Brain Functions**

a) Does the chart report that the patient satisfied criteria for "brain death"?

Yes No

b) If yes, describe the criteria used _____

c) In your opinion, did the patient satisfy criteria for brain death?

yes no unable to determine from chart because _____

d) If you answered "yes" to c), explain the basis of your answer, including the criteria you are using and the relevant findings on the patient.

12. **Donor Status**

Was the patient a kidney donor? Yes No

Unable to determine from chart

If no, was the patient considered for donation and rejected?

Yes No

If rejected, explain _____

Part II: Outcome**A. Death in Hospital**

(Complete Section A only if the record reveals that subject died within the 30-day follow-up period)

1. Date of Death: _____

2. Death was declared based on

- brain criteria
 cardiopulmonary criteria
 unable to determine because _____

3. If the chart reports that there was a determination that the patient was "brain dead", (i.e. you answered "yes" to 11a)

- a) how much time elapsed between the determination of "brain death" by the attending physician (after any confirmatory period) and the declaration of death _____
b) describe the management from the time the physician determined that the patient met brain death criteria and the patient was declared dead

4. If, in your opinion, the patient was "brain dead" although not noted in the chart or met criteria at a time other than that identified in the chart

- a) how much time elapsed between the time the patient met your criteria for "brain death" and death was declared _____
b) describe the management from the time the patient met your criteria and the patient was declared dead

B. Discharged

(Complete this section only if the subject was discharged during the 30-day follow-up)

1. Date of Discharge from Hospital: _____

2. Functional Status: Prior to this On discharge:
 Hospitalization:

Persistent Vegetative State _____ _____

Severe Disability:
dependent on others for all
activities of daily living
(ADL)

Moderate Disability:
dependent on others for
some ADL

Mild Disability: residual damages but independent ADL	—	—
Normal Function	—	—
Not Reported in Chart	—	—
3. Living Condition:	Prior to this Hospitalization:	Discharged to:
Other hospital	—	—
Custodial facility	—	—
Rehabilitation facility	—	—
Home or other non-institutional setting	—	—
Not reported on chart	—	—

C. Hospitalized

(Complete this section only if the subject was in the hospital 30 days after entering the study).

1. 30-day and Last Reported Outcome

Indicate the 30-day outcome and last reported outcome.

	30 day outcome	Last reported outcome
Death	N.A.	—
Persistent Vegetative State	—	—
Severe Disability (dependent on others for all ADL)	—	—
Moderate Disability (dependent on others for some ADL)	—	—
Mild Disability (residual damages but independent ADL)	—	—
Good Recovery	—	—
Not Reported in Chart	—	—
Date of chart note on which 30-day outcome based	_____	
Date of last reported outcome	_____	
In the space below, please provide any additional explanations or comments about responses in Part I or Part II.		

Format for Data Transmission—From Computerized Data Sets at Centers A-C

Simultaneous Criteria for Inclusion:

Motor response no better than localizing (i.e., less than or equal to 5) and Eye opening of none to any stimulus (i.e. score of 1) and on ventilator.

Provide the Following in this Order:

Columns	Information	Codes
1-4	Ident. Number	
5	Hospital	1= 2= 3=
6-7	Age	
8	Sex	1=Male, 2=Female
9-14	Date qualifies	Month (2 digits), Day * (2 digits), Year (2 digits)
15	Period after coma onset for qualification ^t	Period * *
16	Qualifying motor score	1=none, 2=extensor, 3=flexor, 4=withdrawal, 5=localizing
17	Corresponding verbal score	1=none, 2=sounds, 3=words, 4=phrases, 5=oriented, 9=intubated
18	Actual 1 month outcome	1=dead, 2=vegetative, 3=severe disab, 4=mob disab, 5=gd rec
19	Actual 6 month outcome	as for 18
20	Cause of coma	1=hyp-isch, 2=subarach, 3=other cerebrovasc, 4=hepatic, 5=misc, 6=drug, 7=trauma
21	Best pupillary reactivity at time of qualification	1=absent, 2=present, 9=unk
22	Best corneal reflex at time of qualification	1=absent, 2=present, 9=unk
23	Best oculovestibular response at time of qualification	1=absent, 2=present, 9=unk
24	Best oculocephalic response at time of qualification	1=absent, 2=present, 9=unk
25	Spontaneous eye movements at time of qualification	1=absent, 2=present, 9=unk
26-29	Best pupils, corneals, oculocephalics, spontaneous eye movements, and motor responses all unreactive or any reactive at onset, 1, 3, 7 days * * *	1 = all absent, 2=any present, 9=unk
30-33	Oculovestibulars at onset, 1, 3, 7 days	1 =absent, 2=present, 9=unk
34	Time to death	Period * *
35-38	Ventilator used at adm, 1, 3, 7 days	1=no, 2=yes, 9=unk

Columns	Information	Codes
39-42	Steroid used at adm, I, 3, 7 days I=no, 2=yes, 9=unk	
43	Brain dead in chart I=no, 2=yes, 9=unk	
44	Kidney donor I=no, 2=yes, 9=unk	
45	EEG I=isoelectric, 2=abnormal, 3=normal, 9=unk	
46-50	Worst pupils, corneals, oculocephalics, spontaneous eye movements and motor responses all unreactive or any reactive at onset, I, 3, 7 days * * *	I=all absent, 2=any present, 9=unk
51	Outcome at discharge from hospital I=vegetative, 2=severe disability, 3=moderate disability, 4=good recovery	
52	Time from onset until discharge from rcu (specify categories you have)	
53	Time from onset until discharge from hospital (specify categories you have)	
54	Death declared by 1 = brain-based criteria 2 = cardiopulmonary criteria 3=unknown,9=not dead	

*Omit if unknown

^t"qualifies" refers to meeting entrance criteria

**O=adm, 1=0-24 hrs, 2=1-3 days, 3=3-7 days, 4=7-14 days,
5=14d-1m, 6=1-3 m, 7=3-6ni, 8=6-12m

* * *This reflects best/worst reactivity during intervals: onset-1 day; 1-3 days; 3-7 days.

Statutes on the Determination of Death

C

I. ANALYSIS OF STATUTES

A. Degree of Uniformity

Prior to the recommendation of the Uniform Determination of Death Act, five prototype statutes were employed by legislatures: The Kansas law adopted in 1970,¹¹ the model statute prepared by A.M. Capron and L.R. Kass in 1972,¹² the proposal put forward in 1975 by the American Bar Association,¹³ the Uniform Brain Death Act, recommended in 1978 by the National Conference on Commissioners on Uniform State Laws,¹⁴ and the American Medical Association's 1979 proposal.¹⁵ Of the 25 statutes adopted prior to 1981 that are still on the books,¹⁶ 18 were based on the first four models (no state having directly followed the AMA proposal). But in many instances the statutes as enacted depart in significant ways from the prototypes; in addition to the seven states with original legislation not cut to any of the model patterns, almost all of the other 18 contain some verbal variations (from minor to major). Thus, if anything, the patch-

¹¹ Kan. Stat. Ann. ' 77-202 (Cum. Supp. 1979).

¹² Alexander M. Capron and Leon R. Kass, "A Statutory Definition of the Standards for Determining Human Death: An Appraisal and a Proposal," 121 *U. Pa. L. Rev.* 87 (1972), as modified in Alexander M. Capron, "Legal Definition of Death," 315 *Ann. N.Y.Acad. Sci.* 349, 356 (1978).

¹³ 100 *A.B.A. Ann. Report* 231-232 (February 1975 Midyear Meeting).

¹⁴ 12 *Uniform Laws* 5 (Supp. 1980).

¹⁵ 243 *J.A.M.A.* 420 (1980) (editorial).

¹⁶ More than 25 statutes were actually adopted prior to 1981 on the determination of death, since several states (e.g., Idaho, North Carolina and West Virginia) have replaced one statute with another.

work appearance of the map in the Report (Figure 3 at page 65) *overstates* the degree of uniformity achieved thus far.

The prospects for true uniformity are not as bleak as this picture might suggest, however. In the first place, the state adoptions seem to come in groups. For several years immediately after the first statute was adopted in Kansas in 1970,¹⁷ other legislatures used that law as their starting point: Maryland in 1972,¹⁸ and New Mexico and Virginia in 1973.¹⁹ Similarly, four of the five states that now have on their books a statute resembling the ABA proposal acted between 1974 and 1976; the fifth, Wyoming, adopted its law in 1979.²⁰ The two adoptions of the Uniform Brain Death Act came in 1979 and 1980,²¹ and both states that have thus far accepted the Uniform Determination of Death Act did so within a few months time in 1981.²² Second, several states that had enacted statutes, then amended those statutes when "uniform" proposals were put forward.²³ It is reasonable to expect that legislators in the twenty-five states that have accepted the brain-based standard as at least one basis for declaring death would be amenable to adopting the Uniform Determination of Death Act, which recognizes the brain-based standard in the context of a uniform law that also incorporates the cardiopulmonary standard.

Finally, the greatest impediment to uniformity has been the multiplicity of proposals. Nonstandard laws accounted for nearly a third of the total number of 25 state statutes prior to the recent adoption by two states of the new law recommended in the Commission's Report. The increasing number of "models" seems to have caused a flood rather than an ebb in the tide of idiosyncratic bills. Five of the seven nonstandard statutes were enacted since 1977. Moreover, in the absence of a single, uniform proposal, the states turned increasingly to nonstandard statutes; the five adopted in 1977-80 represent nearly half of all the statutes adopted (other than "Uniform" proposals) during this period.

B. Scope of Statutes

1. Single or Multiple Bases for Diagnosis: All of the enacted statutes depart from the common law rule that death

¹⁷ Kan. Stat. Ann. ' 77-202 (Cum. Supp. 1979).

¹⁸ Md. Code Ann., Art. 43, ' 54F (1972).

¹⁹ N.M. Stat. Ann. ' 12-2-4 (1978); Va. Code ' 54.325.7 (1979).

²⁰ Wyo. Stat. ' 35-19-101 (Cum. Supp. 1979).

²¹ Nev. Rev. Stat. ' 451.007 (1979); W. Va. Code ' 16.10-1 (Supp. 1980).

²² Colo. Rev. Stat. ' 12-36-136 (1981); Idaho Code ' 54-1819 (Cum. Supp. 1981).

²³ Idaho Code ' 54-1819 (Cum. Supp. 1981).

occurs only when blood flow and breathing have ceased. The statutes divide, however, into several groups regarding the grounds for determining death that they *do* recognize. One third of the 27 laws presently in force articulate a single, brain-based standard for determining death; they are silent on the relationship between this statutory, neurological "definition" and the common law, cardiopulmonary "definition."

In contrast are the laws of 13 states which explicitly provide for determinations of death by either the newer, neurological standards or the traditional, cardiopulmonary standards. (In some instances the statute spells out the relationships between the two standards, in others it is left to readers to deduce the relationship.)

Halfway between these poles are the statutes in four states that specify cessation of brain functions as a standard for determining death but also accept other, *unspecified* criteria. Rather than being a happy medium, this approach contains the worst of both worlds. On the one hand, it seems intended to recognize that the diagnosis of death in most cases will not be made by physicians directly measuring brain functions. But the means chosen by these statutory drafters to go beyond the single, neurological standard creates an impression that there may be any number of phenomena called death, of which "brain death" is only one. The statutes open up the grounds for determining death to an unspecified range of medical (or even nonmedical) criteria; the Connecticut statute, for example, recognizes brain-based criteria "[w]ithout limiting any other method of determining death."²⁴ On the other hand, these statutes lack the elegance of the single-standard statutes. The additional, vaguer language was plainly added (sometimes, as in the first of these statutes to be adopted, in California,²⁵ through legislative amendment to a bill containing only the single, brain-based standard) out of a recognition that death is diagnosed in most cases through cardiopulmonary tests rather than those that are typically thought of as tests of brain functions. But it replaces the elegance of a "brain only" standard (which rests on the equation of an absence of spontaneous respiratory and circulatory functions with a lack of brain functions) with an open-ended recognition of standards of no specified relationship to "brain death." Finally, the statute adopted in Oregon²⁶ carries the process of expansion one step further. It recognizes irreversible cessation *both* of respiratory/circulatory functions

²⁴ Conn. Gen. Stat. Ann. ' 19-139i (West. Cum. Supp. 1981).

²⁵ Cal. Health & Safety Code ' ' 7180-7182 (Deering Supp. 1980).

²⁶ Or. Rev. Stat. ' 146.087 (1977).

and of brain function. But, in addition, it also accepts without limitation "criteria customarily used by a person to determine death."

The proposed Uniform Determination of Death Act specifies both cardiopulmonary and brain standards as alternative bases for declaring death. These standards exhaust the grounds for such a determination and no unspecified, open-ended language is needed or employed.

2. "Whole" versus "Higher" Brain: The statutes' diversity in accepting one or more standards is matched by the range of wording used to describe the brain standard. All the laws were apparently intended to cover only loss of functioning in the whole brain, not merely in a part. This is clearly expressed in about half the states, in terms that vary somewhat, including "total and irreversible cessation of brain function" (2 states), "irreversible cessation of total brain function" (6 states), "irreversible cessation of all functioning of the brain" (1 state), and "irreversible cessation of the functioning of the entire brain, including the brain stem" (2 states). Some of the statutes state merely "no spontaneous brain function" or "an irreversible cessation of brain function," which by their failure explicitly to *exclude* some parts of the brain imply cessation of functioning in the entire organ. A few of these statutes make this requirement more explicit by linking loss of brain functioning with other signs. Virginia's statute, for example, speaks of "the absence of spontaneous brain functions and spontaneous respiratory functions."²⁷ Spontaneous respiration does not occur in the absence of a functioning brain stem.

The Uniform Determination of Death Act is explicit on this point: it requires irreversible cessation of *all* functions of the *entire* brain, *including the brain stem*.

3. Functions: Despite these elements of diversity in their explicit scope, the enacted statutes have one important point in common: they all provide *standards* for determining whether death has occurred, not the medical criteria or tests for diagnosing whether such standards have been met, and they do so by speaking of the "functions" (or "functioning") of organ systems, not in terms of any cellular *activity* occurring within those organs. The Uniform Determination of Death Act continues this pattern.

C. Applicability

1. Purpose: About half the statutes include some language intended to frame their purpose: for example, "a person is considered medically and legally dead" (4 states), or "for legal and medical purposes" (3 states), or simply "for all legal purposes" (4 states). None of these except for the

²⁷ Va. Code § 54.325.7 (Cum. Supp. 1981).

two statutes that are amendments to the Uniform Anatomical Gift Act, those of Florida²⁸ ("for purposes of the Act") and Connecticut (which speaks only of potential organ "donors" and not of general "individuals"), seems intended to limit the normal application of the statute.²⁹

The other states avoided possible confusion by not stating a "purpose" for a law intended to be generally applied. The Uniform Determination of Death Act likewise contains no such statement of "purposes" or range of application. It applies to all determinations of death.

2. Definition versus Permission: Only a few of the statutes are actually written as "definitions" in the usual sense. The Oklahoma statute is perhaps the best example. It begins straightforwardly: "The term 'dead body' means a human body in which there is irreversible total cessation of brain function."³⁰ Most of the other statutes—including a few, such as those of New Mexico³¹ and Iowa³² that have the appearance of a "definition"—are actually statements of conditions which, when found upon physical examination to be met, establish that an individual has died.

It is important to note, however, that with only a few exceptions the statutes are declaratory and not merely permissive. That is, they establish that an individual who has lost X functions irreversibly (alternatively, one who has lost X or Y functions irreversibly) has died. Several of the nonstandard statutes, however, announce that "a person may be pronounced dead" (Georgia),³³ that "brain death... may be used as a sole basis for the determination that a person has died" (North Carolina),³⁴ or that "a physician... may make such a determination 'if [X] exists'" (Oregon).³⁵ These statutes are responsive to medical needs. They provide a way out of the dilemma created for physicians and families who wish to use vigorous resuscitative measures while also seeing the need to be able to pronounce death when these artificial means produce breathing and blood flow but the individual has lost all brain functions and hence all ability to regain *spontaneous* respiration. But the statutes do not fulfill the need for legal certainty about an individual's *status*, since they make the determination of death permissive.

²⁸ Fla. Stat. ' 382.085 (1980).

²⁹ Conn. Gen. Stat. Ann. ' 19-139i (West Cum. Supp. 1981).

³⁰ Okla. Stat. Ann. tit. 63, ' 1-301(g) (West Cum. Supp. 1981).

³¹ N.M. Stat. Ann. " 12-2-4 and 5 (1978).

³² Iowa Code Ann. ' 702.8 (West 1980).

³³ Ga. Code Ann. ' 88.1715.1 (Cum. Supp. 1980) (emphasis added).

³⁴ N.C. Gen. Stat. ' 90-323 (Cum. Supp. 1979) (emphasis added).

³⁵ Or. Rev. Stat. ' 146.087 (1977) (emphasis added).

The Uniform Determination of Death Act avoids this pitfall. It sets forth alternative standards for determining death; when either is met, the individual *is* dead. (This also avoids the awkwardness of many existing statutes which state that a person "*will be considered dead.*") In most instances, such a determination would be accompanied by an explicit declaration of death by a physician or other qualified observer. But when such a contemporaneous determination is for some reason impossible, not undertaken or actually withheld, the determination could be made after the fact (for example, in a legal proceeding where the time of a particular death is a matter of importance) based upon all the evidence, including the medical records and any postmortem examination.

D. Miscellaneous

1. Standard for Action: Four variations appeared in the model bills to describe the basis on which the criteria and tests used to diagnose death are to be selected and employed. The enacted statutes are almost evenly divided between "ordinary standards of medical practice" and "usual and customary standards of medical practice." These two formulae appear to be synonymous.

Several states require "reasonable medical standards," which is the formula of the Uniform Brain Death Act. Florida blends this with the notion of acceptability and expects determinations to "be made in accordance with currently accepted reasonable medical standards."³⁶ The Florida provision highlights the problem with "reasonableness" in this context. The latter standard invites lay (jury) evaluation after-the-fact and for this reason it is seldom used in judging the performance of professionals. Instead, the competence of professionals is usually measured by whether they came within the boundaries of the theories and practices accepted by their professional groups.

The Uniform Determination of Death Act requires that determinations of death be based upon "accepted medical standards." Idaho, one of the first two states to adopt the new statute, defined accepted medical standards as "the usual and customary procedures of the community in which the determination of death is made."³⁷

2. Authority to Act: Most of the existing statutes are framed in terms of a determination by a "medical doctor" or "physician." The Uniform Determination of Death Act does not explicitly require a physician because in some instances (for example, in the case of a death occurring in a remote area) actions may have to be taken based upon a lay deter-

³⁶ Fla. Stat. ' 382.085 (1980).

³⁷ Idaho Code ' 54-1819 (Cum. Supp. 1981).

mination that breathing and heartbeat have ceased and cannot be revived. Protection against inappropriate action by a lay person under the statute arises from the requirement mentioned above, that all determinations "must be made in accordance with accepted medical standards." Such standards would not countenance a nonphysician diagnosing that all functions of the entire brain had ceased irreversibly for an individual with respirator-supported cardiopulmonary functions but lacking consciousness.

Similarly, the Uniform Determination of Death Act leaves to current medical standards to establish the number and specialized expertise of the physicians who should perform any particular tests. Some of the existing statutes—particularly those that pay direct attention to organ transplantation—specify that *two* physicians must participate in determining death under the brain-based standard. Some even specify the physician's professional qualifications (e.g., Florida: "board-eligible or board-certified neurologist, neurosurgeon, internist, pediatrician, surgeon, or anesthesiologist,"³⁸ and Virginia: "a consulting physician, who shall be duly licensed and a specialist in the field of neurology, neurosurgery, or electroencephalography"³⁹). The protection against conflict of interest—that a physician diagnosing death ought not to participate in the transplantation of organs from the deceased—is spelled out in several statutes.⁴⁰ Such provisions are duplicative of § 7(b) of the Uniform Anatomical Gift Act, which has been adopted in all jurisdictions in the United States.⁴¹

3. Personal Beliefs: None of the existing statutes provide for a "conscience clause" for individuals or their families to "opt out" of the law's provisions. This absence is not surprising in a law intended to establish every individual's status in society (as "alive" or "dead"). The Florida statute does provide, however, for notification of the deceased's next of kin "as soon as practicable of the procedures [used] to determine death" and for the recording in the medical record of such notice or "the attempts to identify and notify the next of kin."⁴² This provision seems intended to avoid or reduce misunderstanding. The need for such a provision is not immediately apparent if physicians are following ac-

³⁸ Fla. Stat. ' 382.085 (1980).

³⁹ Va. Code ' 54.325 (Cum. Supp. 1981).

⁴⁰ See e.g. Cal. Health & Safety Code '' 7180-7182 (Deering Supp. 1980); Hawaii Rev. Stat. ' 327C-1 (Supp. 1980).

⁴¹ Uniform Anatomical Gift Act, see 8 *Uniform Laws Annat.* 608 (1972) at ' 7(b); Annot. 76 A.L.R. 3d 890.

⁴² Alexander Morgan Capron, "The Development of Law on Human Death," 315 *Ann. N.Y. Acad. Sci.* 45, 52 (1978).

cepted medical procedures in dealing with patients' relatives and maintaining medical records; the provision may have resulted from a particular controversy in Florida. In any event, it does not authorize the next of kin to insist that any particular diagnostic approach be employed in preference to another; such matters are left by the statute to medical judgment.

4. Living Will: In a number of jurisdictions bills have been introduced that combine provisions "defining" death with those permitting the use of "living wills" or similar directives to physicians to cease treatment should a person become incompetent while suffering from a terminal illness. In North Carolina a "Natural Death Act" combining these features was adopted in 1977.⁴³ That statute was criticized as "a virtual invitation to litigation, so many are the problems and ambiguities it create[d]."⁴⁴ The statute was subsequently rewritten and reenacted as two separate provisions, with most of the problems in the "definition" of death section removed.⁴⁵

5. Liability: The model statute formulated by the American Medical Association insulated from civil liability or criminal prosecution (i) any physician (or "other person authorized by law to determine death") who acted in accordance with the statute, or (ii) any person "who act[ed] in good faith reliance on [such] a determination."⁴⁶ Such preclusion of liability provisions appear in the statutes adopted in five states.⁴⁷ They are redundant of the protection already provided by the common law and by accepted rules of statutory interpretation. The Uniform Determination of Death Act does not include any preclusion of liability provisions.

⁴³ N.C. Adv. Legis. Servo Ch. 815, ' 90-322.

⁴⁴ Alexander Morgan Capron, "The Development of Law on Human Death" 315 Ann. N.Y. Acad. Sci. 45, 52 (1978).

⁴⁵ N.C. Gen. Stat. ' 90-323 (Cum. Supp. 1979).

⁴⁶ 243 J.A.M.A. 420 (1980) (editorial).

⁴⁷ Ala. ' 22-31-4 (Cum. Supp. 1979); Conn. Gen. Stat. Ann. ' 19-139i(c) (West Cum. Supp. 1981); Fla. Stat. ' 382.085(4) (1980); Ga. ' 88-1715.1(b) (Cum. Supp. 1980); Tex. Rev. Civ. Stat. Ann. art. 447t ' 3 (Vernon Cum. Supp. 1980).

II. MODEL LEGISLATION

ABA

The following is the text of the model statute proposed by the American Bar Association in 1975:

For all legal purposes, a human body with irreversible cessation of total brain function, according to usual and customary standards of medical practice, shall be considered dead.

100 A.B.A. *Ann. Rprt.* 231-32 (1978) (February 1975 midyear meeting)

AMA

The following is the amended model state determination of death bill approved at the December 1979 Interim Meeting of the American Medical Association:

IN THE GENERAL ASSEMBLY

STATE OF _____

An Act

To Provide for Determination of Death

Be it enacted by the People of the State of _____ represented in the General Assembly:

Section 1. An individual who has sustained either (1) irreversible cessation of circulatory and respiratory functions, or (2) irreversible cessation of all functions of the entire brain, shall be considered dead. A determination of death shall be made in accordance with accepted medical standards.

(COMMENT: This section is intended to provide a comprehensive statement for determining death in all situations, by clarifying and codifying the common law in this regard. The two bases set forth in the statute are the only medically accepted bases for determining death, and the statute is therefore all inclusive. "All functions" of the brain means that purposeful activity of the brain, as distinguished from random activity in the brain, has ceased. "Entire brain" includes both the brain stem and the neocortex and is meant to distinguish the concept of neocortical death, which is not a valid medical basis for determining death.)

It is recognized that physicians may determine death. It is also recognized that in some jurisdictions

non-physicians i.e. coroners) are empowered to determine death. It is the intent of this bill to recognize that under accepted medical standards a determination of death based on irreversible cessation of brain function may be made only by a physician.)

Section 2. A physician or any other person authorized by law to determine death who makes such determination in accordance with Section 1 is not liable for damages in any civil action or subject to prosecution in any criminal proceeding for his acts or the acts of others based on that determination.

Section 3. Any person who acts in good faith in reliance on a determination of death is not liable for damages in any civil action or subject to prosecution in any criminal proceeding for his act.

(COMMENT: While Section 1 is intended to remove legal impediments relating to a declaration of death based on medically accepted principles, sections two and three are intended to remove inhibitions from making a declaration of death based on either of the two standards and also to remove inhibitions of hospital personnel from carrying out the direction of a physician in this regard by removing the threat of liability. These sections do not absolve from liability a person who acts negligently or contrary to accepted medical standards.)

Section 4. If any provision of this Act is held by a court to be invalid such invalidity shall not affect the remaining provisions of the Act, and to this end the provisions of this Act are hereby declared to be severable.

Capron-Kass

The following is the modified text of a model bill proposed in 1972 by Professor Alexander M. Capron and Dr. Leon Kass in an article in Volume 121 of the *University of Pennsylvania Law Review* at pages 87-118:

A person will be considered dead if in the announced opinion of a physician, based on ordinary standards of medical practice, he has experienced an irreversible cessation of respiratory and circulatory functions, or in the event that artificial means of support preclude a determination that these functions have ceased, he has experienced an irreversible cessation of total brain functions. Death will have occurred at the time when the relevant functions ceased.

A.M. Capron, "Legal Definition of Death," 315 Ann. N.Y. Acad. Sci. 349, 356 (1978).

Uniform Brain Death Act

The following is a proposal approved and recommended for enactment by the National Conference of Commissioners on Uniform State Laws at its Annual Conference on July 28-August 4, 1978:

Section 1. [Brain Death.] For legal and medical purposes, an individual who has sustained irreversible cessation of all functioning of the brain, including the brain stem, is dead. A determination under this section must be made in accordance with reasonable medical standards.

Comment

This section legislates the concept of brain death. The Act does not preclude a determination of death under other legal or medical criteria, including the traditional criteria of cessation of respiration and circulation. Other criteria are practical in cases where artificial life-support systems are not utilized. Even those criteria are indicative of brain death.

"Functioning" is a critical word in the Act. It expresses the idea of *purposeful* activity in all parts of the brain, as distinguished from random activity. In a dead brain, some meaningless cellular processes, detectable by sensitive monitoring equipment, could create legal confusion if the word "activity" were substituted for "functioning."

Section 2. [Short Title.] This Act may be cited as the Uniform Brain Death Act.

Uniform Determination of Death Act

The following is the text of the statute approved by the National Conference of Commissioners on Uniform State Laws at its Annual Conference on July 26-August 1, 1980, by the American Medical Association on October 19, 1980, by the President's Commission on November 7, 1980, and by the American Bar Association on February 10, 1981 to supersede the existing "model" bills:

Section 1. [Determination of Death.] An individual who has sustained either (1) irreversible cessation of circulatory and respiratory functions, or (2) irreversible cessation of all functions of the entire brain, including the brain stem, is dead. A determination of death must be made in accordance with accepted medical standards.

Section 2. [Uniformity of Construction and Application.] This Act shall be applied and construed to effectuate its general purpose to make uniform the law with respect to the subject of this Act among states enacting it.

Section 3. [Short Title.] This Act may be cited as the Uniform Determination of Death Act.

III: STATE LEGISLATION ADOPTED 1970-1981**Alabama****§ 22-31-1. Standards and procedures for determination of death generally.**

(a) A person is considered medically and legally dead if, in the opinion of a medical doctor licensed in Alabama, based on usual and customary standards of medical practice, in the community, there is no spontaneous respiratory or cardiac function and there is no expectation of recovery of spontaneous respiratory or cardiac function.

(b) In the case when respiratory and cardiac function are maintained by artificial means, a person is considered medically and legally dead if, in the opinion of a medical doctor licensed in Alabama, based on usual and customary standards of medical practice in the community for the determination by objective neurological testing of total and irreversible cessation of brain function, there is total and irreversible cessation of brain function. Death may be pronounced in this circumstance before artificial means of maintaining respiratory and cardiac function are terminated. In the case described in this subsection, there shall be independent confirmation of the death by another medical doctor licensed in Alabama. (Acts 1979, No. 79-165, § 1.)

§ 22-31-2. Use of other methods.

Nothing in this chapter shall prohibit a physician from using other procedures based on usual and customary standards of medical practice for determining death as the exclusive basis for pronouncing a person dead. (Acts 1979, No. 79-165, §1.)

§ 22-31-3. Procedure where part of body to be used for transplantation

(a) When a part of a donor is proposed to be used for transplantation pursuant to article 3 of chapter 19 of this title and the death of the donor is determined as set forth in section 22-31-1, there shall be an independent confirmation of the death by another medical doctor licensed in Alabama. Neither the physician making the determination of death nor the physician making the independent confirmation shall participate in the procedures for removing or transplanting a part.

(b) When a part of a donor is proposed to be used for transplantation pursuant to article 3 of chapter 19 of this title and the death of the donor is determined as set forth in

section 22-31-1, complete patient medical records shall be kept, maintained and preserved. (Act 1979, No. 79-165, §§3,4.)

§ 22-31-4. Liability for acts.

A person who acts in accordance with the terms of this chapter is not liable for damages in any civil action or subject to prosecution in any criminal proceeding for his act. (Acts 1979, No. 79-165, § 5.)

Ala. Code § § 22-31-1 through 22-31-4 (Cum. Supp. 1979)
(Effective June 5, 1979).

Alaska

Sec. 09.65.120. Definition of death. A person is considered medically and legally dead if, in the opinion of a medical doctor licensed or exempt from licensing under AS 08.64, based on ordinary standards of medical practice, there is no spontaneous respiratory or cardiac function and there is no expectation of recovery of spontaneous respiratory or cardiac function or, in the case when respiratory and cardiac functions are maintained by artificial means, a person h. considered medically and legally dead, if, in the opinion of a medical doctor licensed or exempt from licensing under AS 08.64, based on ordinary standards of medical practice, there is no spontaneous brain function. Death may be pronounced in this circumstance before artificial means of maintaining respiratory and cardiac function are terminated. (§ 1 ch 8 SLA 1974)

Alaska Stat. § 09.65.120 (Cum. Supp. 1980)

Arkansas

82-537. Death defined. -A person is legally dead when the brain has irreversibly ceased to function and there is an absence of spontaneous breath. [Acts. 1979, No. 99, § 1]

82-538. Standard of medical practice. -The diagnosis of death as defined in this ACT [§ § 82-537, 82-538] shall be made using ordinary standards of medical practice. [Acts 1979, No. 99, § 2]

Ark. Stat. Ann. §§ 82-537-82-538 (Cum. Supp. 1981) (Effective February 11, 1979)

California

§7180. Pronouncement on determining cessation of brain function: Confirmation: Other procedures.

A person shall be pronounced dead if it is determined by a physician that the person has suffered a total and irreversible cessation of brain function. There shall be independent confirmation of the death by another physician.

Nothing in this chapter shall prohibit a physician from using other usual and customary procedures for determining death as the exclusive basis for pronouncing a person dead.

§ 7181. Confirmation in event of transplantation under Uniform Anatomical Gift Act: Restriction on physician's participation in removal and transplantation.

When a part of the donor is used for direct transplantation pursuant to the Uniform Anatomical Gift Act (Chapter 3.5, commencing with Section 7150) and the death of the donor is determined by determining that the person has suffered a total and irreversible cessation of brain function there shall be an independent confirmation of the death by another physician. Neither the physician making the determination of death under Section 7155.5 nor the physician making the independent confirmation shall participate in the procedures for removing or transplanting a part.

§ 7182. Patient medical records.

Complete patient medical records required of a health facility pursuant to regulations adopted by the department in accordance with Section 1275 shall be kept, maintained, and preserved with respect to the requirements of this chapter when a person is pronounced dead by determining that the person has suffered a total and irreversible cessation of brain function.

Cal. Health & Safety Code §§ 7180–7182 (Deering Supp. 1980)

(Added Stats. 1974 ch 1524 § 1, effective September 27, 1974).

Colorado

12-36-136. Determination of death.

(1) An individual is dead if:

- (a) He has sustained irreversible cessation of circulatory and respiratory function; or
- (b) He has sustained irreversible cessation of all functions of the entire brain, including the brain stem.

(2) A determination of death under this section shall be in accordance with accepted medical standards.

SECTION 2. Safety clause. The general assembly hereby finds, determines, and declares that this act is necessary for the immediate preservation of the public peace, health, and safety.

Colo. Rev. Stat. § 12-36-136 (1981).

(Approved May 21, 1981)

Connecticut

§ 19-139i. Acceptance and rejection of gift. Determination of time of death. Civil and criminal liability. Approved by medical examiner or coroner.

(b) The time of death shall be determined by two physicians who attend the donor at his death, or if none, two physicians who certify death, who shall use generally recognized and accepted scientific and clinical means to determine such time of death. Without limiting any other method of determining death, a donor may be pronounced dead if two physicians determine, in accordance with the usual and customary standards of medical practice, that the donor has suffered a total and irreversible cessation of all brain function. A total and irreversible cessation of all brain function shall mean that the heart and lungs of the donor cannot function, and are not functioning, without artificial supportive measures. The physicians who so certify shall not participate in the procedures for removing or transplanting a part. No organ shall be removed for transplantation until death has been pronounced.

(c) A person who acts in good faith in accordance with the terms of sections 19-139a and 19-139c to 19-139j, inclusive, shall not be liable for damages in any civil action or subject to prosecution in any criminal proceeding for his act.

Conn. Gen. Stat. Ann. § 19-139i (West Cum. Supp. 1981) (1979, P.A. 79-556 amended subsec. (b) by inserting the second, third and fifth sentences.)

Florida

§ 382.085. Recognition of brain death under certain circumstances

(1) For legal and medical purposes, where respiratory and circulatory functions are maintained by artificial means of support so as to preclude a determination that these functions have ceased, the occurrence of death may be determined where there is the irreversible cessation of the functioning of the entire brain, including the brain stem, determined in accordance with this section.

(2) Determination of death pursuant to this section shall be made in accordance with currently accepted reasonable medical standards by two physicians licensed under chapter 458 or chapter 459. One physician shall be the treating physician, and the other physician shall be a board-eligible or board-certified neurologist, neurosurgeon, internist, pediatrician, surgeon, or anesthesiologist.

(3) The next of kin of the patient shall be notified as soon as practicable of the procedures to determine death under this section. The medical records shall reflect such notice; if such notice has not been given, the medical records shall reflect the attempts to identify and notify the next of kin.

(4) No recovery shall be allowed nor shall criminal proceedings be instituted in any court in this state against a physician or licensed medical facility that makes a determination of death in accordance with this section or which act in reliance thereon, if such determination is made in accordance with the accepted standard of care for such physician or facility set forth in s. 768.45. Except for a diagnosis of brain death, the standard set forth in this section is not the exclusive standard for determining death or for the withdrawal of life-support systems. (Added by Laws 1980, c. 80-216, § 1)

Fla. Stat. § 382.085 (1980).
(Effective October 1, 1980).

Georgia

§88-1715.1 Determination of death

(a) A person may be pronounced dead if it is determined that the person has suffered an irreversible cessation of brain function. There shall be independent confirmation of the death by another physician.

(b) A person who acts in good faith in accordance with the provisions of subsection (a) shall not be liable for damages in any civil action or subject to prosecution in any criminal proceeding for such act.

(c) The criteria for determining death authorized in subsection (a) shall be cumulative to and shall not prohibit the use of other medically recognized criteria for determining death.

(Acts 1975, p. 1629)

Ga. Code Ann. § 88-1715.1 (Cum. Supp. 1980)
(Adopted April 28, 1975)

Hawaii

§ 327C-1. Determination of Death.

(a) Except as provided in subsection (b) of this section, a person shall be considered dead if in the announced opinion of a physician licensed under chapter 453, based on ordinary standards of current medical practice the person has

experienced irreversible cessation of spontaneous respiratory and circulatory functions. Death will have occurred at the time when the irreversible cessation of the functions first coincided.

(b) In the event that artificial means of support preclude a determination that respiratory and circulatory functions have ceased, a person shall be considered dead if, in the opinion of an attending physician licensed under chapter 453, and of a consulting physician licensed under chapter 453, based on ordinary standards of current medical practice, the person has experienced irreversible cessation of brain function. The opinions of the physicians shall be evidenced by signed statements. Death will have occurred at the time when the irreversible cessation of brain function first occurred. Death shall be pronounced before artificial means of support are withdrawn and before any vital organ is removed for purposes of transplantation.

(c) When a part of a donor is used for direct organ transplantation under chapter 327, and the donor's death is established by determining that the donor experienced irreversible cessation of brain function, the determination shall only be made under subsection (b) of this section. The physicians making the determination of death shall not participate in the procedures for removing or transplanting a part, or in the care of any recipient.

(d) All death determinations in the State shall be made pursuant to this section and shall apply to all purposes, including but not limited to civil and criminal actions, any laws to the contrary notwithstanding, provided that presumptive deaths under the Uniform Probate Code shall not be affected by this section.

(e) The director of health shall convene in every odd-numbered year, a committee which shall be composed of representatives of appropriate general and specialized medical professional organizations, licensed attorneys, and members of the public. The committee shall review medical practice, legal developments, and other appropriate matters to determine the continuing viability of this section and shall submit a report of its findings and recommendations to the legislature, prior to the convening of the regular session held in each even-numbered year.
[1978, c 248, § 1; am L 1979, C 193; § 1]

Hawaii Rev. Stat. § 327 C-1 (Supp. 1980)

(L 1979 substituted "person" for "human body" in subsections (a) and (b), deleted reference to neurologist and neurosurgeon from subsection (b), and rephrased last sentence of subsection (c).)

Idaho

54-1819. Definition and procedure for determination of death.

(1) An individual who has sustained either (a) irreversible cessation of circulatory and respiratory functions, or (b) irreversible cessation of all functions of the entire brain, including the brain stem, is dead.

(2) A determination of death must be made in accordance with accepted medical standards which mean the usual and customary procedures of the community in which the determination of death is made. [I.C., § 54-1819, as added by 1981, ch. 258, § 2, p. 549.]

Former § 54-1819 (1977, ch. 130, § 1, p. 276) was repealed by S.L. 1981, ch. 258, § 1.

Illinois**§ 302 Definitions**

(b) "Death" means for the purposes of the Act, the irreversible cessation of total brain function, according to usual and customary standards of medical practice.

Ill. Ann. Stat. ch. 1101/2 §302 (Smith-Hurd Cum. Supp. 1978)
(Effective October 1, 1975)

Iowa**702.8 Death.**

"Death" means the condition determined by the following standard: A person will be considered dead if in the announced opinion of a physician, based on ordinary standards of medical practice, that person has experienced an irreversible cessation of spontaneous respiratory and circulatory functions. In the event that artificial means of support preclude a determination that these functions have ceased, a person will be considered dead if in the announced opinion of two physicians, based on ordinary standards of medical practice, that person has experienced an irreversible cessation of spontaneous brain functions. Death will have occurred at the time when the relevant functions ceased.

Acts 1976 (66 G.A.) ch. 1245, ch. 1 § 208

Iowa Code Ann. § 702.8 (West 1980)
(Effective January 1, 1978)

Kansas

77-202. Definition of death.

A person will be considered medically and legally dead if, in the opinion of a physician, based on ordinary standards of medical practice, there is the absence of spontaneous respiratory and cardiac function and, because of the disease or condition which caused, directly or indirectly, these functions to cease, or because of the passage of time since these functions ceased, attempts at resuscitation are considered hopeless; and, in this event, death will have occurred at the time these functions ceased; or

A person will be considered medically and legally dead if, in the opinion of a physician, based on ordinary standards of medical practice, there is the absence of spontaneous brain function; and if based on ordinary standards of medical practice, during reasonable attempts to either maintain or restore spontaneous circulatory or respiratory function in the absence of aforesaid brain function, it appears that further attempts at resuscitation or supportive maintenance will not succeed, death will have occurred at the time when these conditions first coincide. Death is to be pronounced before any vital organ is removed for purposes of transplantation.

These alternative definitions of death are to be utilized for all purposes in this state, including the trials of civil and criminal cases, any laws to the contrary notwithstanding.

Kan. Stat. Ann. § 77-202 (Cum. Supp. 1979)

(K.S.A. § 77-202; L. 1979, ch. 199, § 11; July 1. Deleted the provision requiring the pronouncement of death before artificial means of supporting respiratory and circulatory functions are terminated.)

(Enacted
1970)

Louisiana

§111. Definition of death.

A person will be considered dead if in the announced opinion of a physician, duly licensed in the state of Louisiana based on ordinary standards of approved medical practice, the person has experienced an irreversible cessation of spontaneous respiratory and circulatory functions. In the event that artificial means of support preclude a determination that these functions have ceased, a person will be considered dead if in the announced opinion of a physician, duly licensed in the state of Louisiana based upon ordinary standards of approved medical practice, the person has experienced an irreversible total cessation of brain function. Death will have occurred at the time when the rel-

event functions ceased. In any case when organs are to be used in a transplant, then an additional physician, duly licensed in the state of Louisiana not a member of the transplant team, must make the pronouncement of death.

La. Rev. Stat. Ann. § 9:111 (West Cum. Supp. 1981) (Added by Acts 1976, No. 233, §1)

Maryland

§ 54F. When person considered medically and legally dead.

(a) A person will be considered medically and legally dead if, based on ordinary standards of medical practice, there is the absence of spontaneous respiratory and cardiac function and, because of the disease or condition which caused, directly or indirectly, these functions to cease, or because of the passage of time since these functions ceased, attempts at resuscitation are considered hopeless; and, in this event, death will have occurred at the time these functions ceased; or

(b) A person will be considered medically and legally dead if, in the opinion of a physician, based on ordinary standards of medical practice and because of a known disease or condition, there is the absence of spontaneous brain function; and if based on ordinary standards of medical practice, during reasonable attempts to either maintain or restore spontaneous circulatory or respiratory function in the absence of spontaneous brain function, it appears that further attempts at resuscitation or supportive maintenance will not succeed, death will have occurred at the time when these conditions first coincide. Death is to be pronounced before artificial means of supporting respiratory and circulatory function are terminated and before any vital organ is removed for purposes of transplantation.

(c) These alternative definitions of death are to be utilized for all purposes in this State, including the trials of civil and criminal cases, any laws to the contrary notwithstanding. (1972, ch. 693).

Md. Ann. Code art. 43, § 54F (1980)

(Effective July 1, 1972)

Michigan

§14.15(1021) Determination of death; means; time of death.

SEC. 1. A person will be considered dead if in the announced opinion of a physician, based on ordinary standards of medical practice in the community, there is the irreversible cessation of spontaneous respiratory and circu-

latory functions. If artificial means of support preclude a determination that these functions have ceased, a person will be considered dead if in the announced opinion of a physician, based on ordinary standards of medical practice in the community, there is the irreversible cessation of spontaneous brain functions. Death will have occurred at the time when the relevant functions ceased. (MCL §333.1021.)

§14.15(1022) Pronouncement of death before termination of life support systems.

SEC. 2. Death is to be pronounced before artificial means of supporting respiratory and circulatory functions are terminated. (MCL § 333.1022.)

§14.15(1023) Means of determining death, use.

SEC. 3. The means of determining death in section 1 shall be used for all purposes in this state, including the trials of civil and criminal cases. (MCL §333.1023.)

Statutory reference. Section 8b of Act No. 343 of 1925, above referred to, is § 14.228 (2).

Mich. Stat. Ann. § 14.15 (1021 to 1024) (Cum. Supp. 1981)

Montana

50-22-101. Definition of death.

A human body with irreversible cessation of total brain function as determined according to usual and customary standards of medical practice, is dead for all legal purposes.

Mont. Rev. Codes Ann. § 50-22-101 (1978)

(Enacted 69-7201 by Sec. 1, Ch. 228, L. 1977, R.C.M. 1947, 69-7201.)

(Adopted April 4, 1977)

Nevada

§ 451.007. Definition of death for legal, medical purposes.

1. For legal and medical purposes, a person who has sustained irreversible cessation of all functioning of the brain, including the brain stem, is dead. A determination under this section must be made in accordance with reasonable medical standards.

2. This section may be cited as the Uniform Brain Death Act.

Nev. Rev. Stat. § 451.007 (1979)

(Added to NRS by 1979, 226)

(Approved, April 20, 1979)

New Mexico

12-2-4. Death defined.

A. For all medical, legal and statutory purposes, death of a human being occurs when, and "death," "dead body," "dead person" or any other reference to human death means that:

(1) based on ordinary standards of medical practice, there is the absence of spontaneous respiratory and cardiac function and, because of the disease or condition which caused, directly or indirectly, these functions to cease, or because of the passage of time since these functions ceased, there is no reasonable possibility of restoring respiratory or cardiac functions; in this event death occurs at the time respiratory or cardiac functions ceased; or

(2) in the opinion of a physician, based on ordinary standards of medical practice:

(a) because of a known disease or condition there is the absence of spontaneous brain function; and

(b) after reasonable attempts to either maintain or restore spontaneous circulatory or respiratory functions in the absence of spontaneous brain function, it appears that further attempts at resuscitation and supportive maintenance have no reasonable possibility of restoring spontaneous brain function; in this event death will have occurred at the time when the absence of spontaneous brain function first occurred. Death is to be pronounced pursuant to this paragraph before artificial means of supporting respiratory or circulatory functions are terminated and before any vital organ is removed for purposes of transplantation in compliance with the Uniform Anatomical Gift Act [24-6-1 to 24-6-9 NMSA 1978].

B. The alternative definitions of death in Paragraphs (1) and (2) of Subsection A of this section are to be utilized for all purposes in this state, including but not limited to civil and criminal actions, notwithstanding any other law to the contrary.

12-2-5. Death defined; presumptive decedents.

Presumptive decedents under Section 31-41-1 NMSA 1953 shall not be affected by this act [12-2-4, 12-2-5 NMSA 1978].

N.M. Stat. Ann. § 12-2-4 (1978)

(1953 Comp., § 1-2-2.2, enacted by Laws 1973, Ch. 168, §§ 1-22)
(Laws 1973, Ch. 168 contains no effective date provision, but was enacted at a session which adjourned on March 17, 1973.)

North Carolina

§ 90-323. Death; determination by physician.

The determination that a person is dead shall be made by a physician licensed to practice medicine applying ordinary and accepted standards of medical practice. Brain death, defined as irreversible cessation of total brain function, may be used as a sole basis for the determination that a person has died, particularly when brain death occurs in the presence of artificially maintained respiratory and circulatory functions. This specific recognition of brain death as a criterion of death of the person shall not preclude the use of other medically recognized criteria for determining whether and when a person has died. (1979, c. 715, s. 3.)

N.C. Gen. Stat. § 90-323 (Cum. Supp. 1979)

Oklahoma

§ 1-301. Definitions. As used in this article:

(g) The term "dead body" means a human body in which there is irreversible total cessation of brain function; and if, based upon ordinary standards of medical practice, during reasonable attempts to either maintain or restore spontaneous circulatory or respiratory function in the absence of aforesaid brain function, it appears that further attempts at resuscitation or supportive maintenance will not succeed, death will have occurred at the time when these conditions first coincide. Death is to be pronounced before artificial means of supporting respiratory and circulatory function are terminated and before any vital organ is removed for purposes of transplantation.

Okla. Stat. Ann. tit. 63, § 1-103 (g) (West Cum. Supp. 1981)
(Effective April 28, 1975)

Oregon

146.087 Criteria for determination of death.

In addition to criteria customarily used by a person to determine death, when a physician licensed to practice medicine under ORS chapter 677 acts to determine that a person is dead, he may make such a determination if irreversible cessation of spontaneous respiration and circulatory function or irreversible cessation of spontaneous brain function exists. [1975 c. 565 § 1]

Or. Rev. Stat. § 146.087 (1977)

Tennessee 53.459.

Death Defined.

For all legal purposes, a human body, with irreversible cessation of total brain function, according to the usual and

customary standards of medical practice, shall be considered dead.
[Acts 1976 (Adj. S.), ch. 780, § 1.]

Tenn. Code Ann. § 53-459 (Cum. Supp. 1980)
(Adopted March 18, 1976)

Texas

Art. 4447t. Determination of death.

Section 1. (a) A person will be considered legally dead if, based on ordinary standards of medical practice, there is the irreversible cessation of spontaneous respiratory and circulatory functions.

(b) If artificial means of support preclude a determination that spontaneous respiratory and circulatory functions have ceased, a person will be considered legally dead if in the announced opinion of a physician, based on ordinary standards of medical practice, there is the irreversible cessation of all spontaneous brain function. Death will have occurred at the time when the relevant functions ceased.

(c) Death is to be pronounced before artificial means of supporting respiratory and circulatory functions are terminated.

Section 2. A physician who determines death in accordance with the provisions of Section 1(b) of this Act is not liable for damages in any civil action or subject to prosecution in any criminal proceeding for his or her acts or the actions of others based on that determination.

Section 3. A person who acts in good faith in reliance on a determination of death by a physician is not liable for damages in any civil action or subject to prosecution in any criminal proceeding for his or her act.

Act 1979, 66th Leg., p. 368, ch. 165.

Tex. Rev. Civ. Stat. Ann. art. 4447t (Vernon Cum. Supp. 1980)
(Effective May 15, 1979)

Virginia

§ 54-325.7. When person deemed medically and legally dead.

A person shall be medically and legally dead if, (a) in the opinion of a physician duly authorized to practice medicine in this Commonwealth, based on the ordinary standards of medical practice, there is the absence of spontaneous respiratory and spontaneous cardiac functions and, because of the disease or condition which directly or indirectly caused these functions to cease, or because of the passage of time since these functions ceased, attempts at resuscitation

would not, in the opinion of such physician, be successful in restoring spontaneous life-sustaining functions, and, in such event, death shall be deemed to have occurred at the time these functions ceased; or (b) in the opinion of a consulting physician, who shall be duly licensed and a specialist in the field of neurology, neurosurgery, or electroencephalography, when based on the ordinary standards of medical practice, there is the absence of spontaneous brain functions and spontaneous respiratory functions and, in the opinion of the attending physician and such consulting physician, based on the ordinary standards of medical practice and considering the absence of spontaneous brain functions and spontaneous respiratory functions and the patient's medical record, further attempts at resuscitation or continued supportive maintenance would not be successful in restoring such spontaneous functions, and, in such event, death shall be deemed to have occurred at the time when these conditions first coincide. Death, as defined in subsection (b) hereof, shall be pronounced by the attending physician and recorded in the patient's medical record and attested by the aforesaid consulting physician.

Notwithstanding any statutory or common law to the contrary, either of these alternative definitions of death may be utilized for all purposes in the Commonwealth, including the trial of civil and criminal cases.

(Code 1950, § 32-364.3:1; 1973, c. 252; 1979, c. 720)

Va. Code § 54-325.7 (Cum. Supp. 1981)

(Effective March 13, 1973)

West Virginia

16-19-1. Definitions.

(c) "Death" means that a person will be considered dead if in the announced opinion of the attending physician, made in accordance with reasonable medical standards, the patient has sustained irreversible cessation of all functioning of the brain.

W. Va. Code § 16-19-1 (Supp. 1980)

(Effect of amendment of 1980.- The amendment, in subsection (c), substituted the language beginning "made in accordance with reasonable medical standards" for "based on ordinary standards of medical practice, the patient has experienced an irreversible cessation of spontaneous respiratory and circulatory function; or, in the event that artificial means of support preclude a determination that these functions have ceased, a person will be considered dead if in the announced opinion of a physician, based on ordinary standards of medical practice, the patient has experienced an irreversible cessation of spontaneous brain functions,"

and deleted the former second paragraph, which read: "Death will have occurred at the time when the relevant functions ceased.")

Wyoming

§ 35-19-101. Brain death; determination in accordance with medical standards.

For all legal purposes, a human body, with irreversible cessation of total brain function, including the brain stem, according to the usual and customary standards of medical practice, is dead. Total brain function shall mean purposeful activity of the brain as distinguished from random activity.

(Laws 1979, ch. 101, § 1.)

Wyo. Stat. § 35-19-101 (Cum. Supp. 1979) (Effective February 22, 1979)

Judicial Developments in the "Definition" of Death

D

Judicial decisions "defining" death are of three types: those that adhere to the cardiopulmonary standard, those that updated the cardiopulmonary standard prior to any legislative "modernization," and those that interpret recent statutes which include brain-based language.

I. Traditional Rulings

The courts long ago established that "the cessation of life" was to be judged primarily by "a total stoppage of the circulation of the blood," in the words of *Black's Law Dictionary*.¹ Black's which is not usually a leading legal authorityCwhich is not usually a leading legal authorityCis associated with this "definition" because the dictionary language was repeated *in haec verba* in a number of judicial opinions. Indeed, this interpretation was reiterated despite the development of medical techniques that could revive respiration and circulation in a corpse. Though medical evidence was presented in litigation contradicting the old "definition," courts into the 1970's favored consistency over modernity in the law. The most recent example of this is *State v. Johnson*:

There are presently no statutory provisions in the Ohio Revised Code which define death. . . . [W]hile the present trend is toward adoption of some phase of the general "brain death" theory, most states, including Ohio, have not yet altered the traditional common law approach that death means the permanent cessation of all vital functions and the fact and time of its occurrence are questions for the jury.²

¹ Black's Law Dictionary, (4th ed.) West Publishing Co., St. Paul, Minn., (1968) at 488, but see Black's Law Dictionary (5th ed.) Vest Publishing Co., St. Paul, Minn. (1979) at 170, which now includes an entry under the heading "brain death."

² State v. Johnson, 395 N.E.2d 368, 371-72 (Ohio 1977).

Nevertheless, courts of late have generally been willing either to "update" the "definition" of death or to avoid the incongruous results that would follow from applying cardiopulmonary standards in determining death for individuals on respirator support.

II. Judicial Revisions of the Law

A. Criminal Cases Updating the Common Law

Opportunities to update the common law in the absence of a statutory definition have arisen in two major contexts. The first is in murder trials where defendants have maintained that the victim of their act was still "alive" when artificial life-support systems were removed. This defense has (with one reported exception at the trial level, which was thereafter reversed¹) been uniformly rejected by the judiciary.² Courts have articulated three reasons for regarding the defendant as responsible for the victim's death: "proximate cause," "cause in fact," and a judicial recognition of a new standard of death. Only the last group of cases explicitly updates the common law rules.

The "proximate cause" argument relies upon the well accepted legal principle that a criminal defendant is liable for the natural consequences of his act.³ Even negligent care by physicians attending the victim of an alleged criminal act does not relieve the defendant from responsibility for the consequences. Thus, even if the defendants in these cases were correct that their victims had still been legally alive when artificial respiratory support systems were removed, their indictments and convictions would not thereby be invalid. "The state is only required to prove beyond a reasonable doubt that the defendant's acts were 'a substantial factor in producing the death'."⁴ (Moreover, in the case that emphasized this view most clearly, *People v. Olson*,⁵ the Illinois court found the physicians' decision to withdraw heart-lung support measures to be reasonable.)

¹ *People v. Flores*, No. 7246-C (Sonoma County, Cal., Super. Ct. 1974). After Flores' indictment was reinstated, he was tried and convicted of vehicular manslaughter and felony drunk driving. The light sentence he received (less than five months) was attributed by the prosecutor to "the uncertain state of the case and statutory law on the subject of brain death." Frank J. Veith, Jack M. Fein, Moses D. Tendler, Robert M. Veatch, Marc A. Kleiman & George Kalkines, "Brain Death: II. A Status Report of Legal Considerations," 238 *I.A.M.A.* 1744, 1746 (1977).

² See e.g. *People v. Saldana*, 47 Cal. App. 3d 954, 121 Cal. Rptr. 243 (1975); *State v. Brown*, 8 Or. App. 72,491 P.2d 1193 (1971).

³ *Johnson v. State*, 64 Fla. 321, 59 So. 894 (1912); *Hamblin v. State*, 81 Neb. 148, 115 N.W. 850 (1908).

⁴ *Cranmore v. State*, 271 N.W.2d 402, 428 (Wis. App. 1978).

⁵ *People v. Olson*, 377 N.E.2d 371 (Ill. 1978).

In a similar "proximate cause" case, *State v. Fierro*,¹ the Arizona Supreme Court held that although the common law cardiopulmonary standard is still sufficient to establish death, the medical criteria of the *ad hoc* Harvard Committee or the legal standard put forward by Uniform Brain Death Act (which are not in actuality comparable documents) are also valid bases for declaring death, when properly supported by medical testimony. The removal of the respiratory-support systems was thus found not to be the proximate cause of the victim's death. It was not error for the trial court to have found that the gunshot wound inflicted by the defendant caused the victim's death.

Other courts have relied on "cause in fact." Under this approach, the courts do not explicitly revise the "definition" of death, but they accept the physicians' conclusions about the occurrence of death as matters of fact. For instance, in a case involving a gunshot wound to the head, *State v. Brown*,² the Oregon appellate court held that the victim's life was terminated by the bullet wound that caused "damage to the vital centers of the brain which control respiration and other body activities."³

In *People v. Saldana*⁴ the doctor testified that death is "a failure of part of that organism such that the total organism is no longer functioning in a manner which a reasonable, intelligent person would recognize as the purpose of that organism."⁵ In the absence of evidence to contradict the doctor's testimony that the victim suffered brain death, the court held that the victim's death was caused by the defendant's act. "Given the current state of medical science . . . we cannot say as a matter of law that the victim was not dead when he reached the hospital, much less when the artificial life-support systems were-removed."⁶

The third ground on which homicide defendants' claims have been rejected is the most sweeping, namely, judicial revision of the common law standard for deciding when death has occurred. In upholding criminal convictions, the highest courts of both Massachusetts and Colorado have explicitly adopted a "brain death" standard.

¹ *State v. Fierro*, 124 Ariz. 182,603 P.2d 74 (1979).

² *State v. Brown*, 8 Or. App. 72,491 P.2d 1193 (1971).

³ *Id.* at 1195.

⁴ *People v. Saldana*, 47 Cal. App. 3d 954, 121 Cal. Rptr. 243 (1975).

⁵ *Id.* at 245.

⁶ *Id.* at 244.

The first state supreme court case was that of *Commonwealth v. Golston*,¹ a 1977 Massachusetts case. The trial judge had instructed the jury "as a matter of law, the occurrence of a brain death, if you find it, satisfies the essential element of the crime of murder requiring proof beyond a reasonable doubt of the death of the victim."² Borrowing from the language of the recent statutes, the judge stated that, "Brain death occurs when, in the opinion of a licensed physician, based on ordinary and accepted standards of medical practice, there has been a total and irreversible cessation of spontaneous brain functions and further attempts at resuscitation or continued supportive maintenance would not be successful in restoring such functions."³

The Supreme Court of Massachusetts held the trial judge had acted correctly in accepting the medical concept of brain death. (Alternatively, the court held any error in this respect to be harmless beyond a reasonable doubt.) The court limited its holding to criminal cases, however.

In the Colorado case of *Lovato v. District Court*⁴ the trial judge had held "[A]s the rule of this case. .. to be followed until otherwise changed legislatively or judicially, we adopt the provisions of the proposed Uniform [Brain Death] Act. . . Our recognition of this concept of brain death does not preclude continuing recognition of the standard of death as determined by traditional criteria of cessation of respiration and circulation."⁵ The effect of the decision was to provide alternative determinations of death.

The Supreme Court of Colorado upheld the District Court. In doing so, the court explicitly addressed two important issues: the relationship between judicial and legislative revision of the common law, and the grounds on which established precedent may sometimes be abandoned:

We recognize the authority of, and indeed encourage, the General Assembly to pronounce statutorily the standards by which death is to be determined in Colorado. We do not, however, believe that in the absence of legislative action we are precluded from facing and resolving the legal issue of whether irretrievable loss of brain function can be used as a means of detecting the condition of death. Under the circumstances of this case we are not only entitled to resolve

¹ Commonwealth v. Golston, 373 Mass. 249, 366 N.E.2d 744 (1977), cert. denied, 434 U.S. 1039 (1978).

² *Id.* at 747.

³ *Id.* at 747-8.

⁴ Lovato v. District Court, 601 P.2d 1072 (Colo. 1979) (*en banc*).

⁵ *Id.* at 1081.

the question, but have a duty to do so. To act otherwise would be to close our eyes to the scientific and medical advances made worldwide in the past two or three decades.¹

B. Civil Cases Updating the Common Law

The second major legal context affording judges the opportunity to update the common law has been in civil actions. These cases have addressed directly the issue of organ transplantation based upon the "definition" of death.

The 1972 Virginia case of *Tucker v. Lower* has received considerable attention although it did not progress beyond the trial level.² Following a workplace accident, the plaintiff's brother had been taken unconscious to a hospital where surgery for severe head injuries was performed. After the treating physicianAs decided the victim was "brain dead," he was taken off the respirator and his heart and kidneys were removed for transplantation. The victim's brother brought suit against the physicians and surgeons under the Virginia wrongful death act.³ One of his grounds for recovery was that the operation had been commenced before death had occurred. To support this contention, the plaintiff established that the brother's heart was still beating as a result of the respiratory treatment at the time death was declared.

The trial judge refused the defendants' motion to dismiss the case or to grant summary judgment in their favor. He held that the "definition" of death was the "all vital bodily functions" test established by the common law. Yet at the last minute, the judge apparently reconsidered his decision and instructed 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 con-

¹ *Id.* at 1081.

² *Tucker v. Lower*, No. 2831 (Richmond, Va. L. & Eq. Ct., May 23, 1972); See, e.g., Robert M. Veatch, *Death, Dying and the Biological Revolution: Our Last Quest for Responsibility*, Yale University Press, New Haven, Conn., (1977) at 21-24; Alexander Morgan Capron, "Legal Definition of Death," 315 *Ann. N.Y. Acad. Sci.* 349,351 (1978).

³ Va. Code § 8-633 *et seq.* (1970).

ditions 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.¹

The jury acquitted the defendants. Because there was no appeal, higher courts did not have occasion to rule on the soundness of the trial judge's revision of the standards for determining death. Thus, the case did not establish a new rule on the legal standard to be used in Virginia for determining when death occurs. It did, however, prompt the Virginia medical society to support a statute which was adopted by the legislature the year after *Tucker v. Lower* recognizing brain cessation as one ground for declaring death.² (Indeed, in most of the states in which cases illuminating the inadequacies of the common law "definition" have arisen, the legislature has reacted by enacting a statute on the subject.³)

The "definition" arose in a narrower but more conclusive fashion in *New York City Health and Hospital Corp. v. Sulsona*,⁴ another organ transplant case. The petitioner sought a declaratory judgment to construe the time of death provisions in New York's Anatomical Gift Act.⁵ Section 7(b) of the Uniform Anatomical Gift Act merely provides that 'The time of death shall be determined by a physician who attends the donor at his death or, if none, the physician who certifies death."

The controversy in *Sulsona* arose because of the difficulty, under the common law and the policies of the Chief Medical Examiner of New York City, in carrying out organ transplants from suitable donors who were determined to be dead on neurological grounds. The trial judge held: "The context in which the term 'death' is used in Sections 4301 and 4306 of Article 43 of the Public Health Law implies a definition consistent with the generally accepted medical practice of doctors primarily concerned with effectuating the purposes of this statute."⁶ The judge noted that this

¹ *Tucker v. Lower*, No. 2831 (Richmond, Va. L. & Eq. Ct., May 23, 1972).

² Va. Code § 54.325.7 (Cum. Supp. 1981).

³ See e.g., Cal. Health & Safety Code §§ 7180-7182 (Deering Supp. 1980) Or. Rev. Stat. § 146.087 (1977).

⁴ *New York City Health and Hospital Corp. v. Sulsona*, 81 Misc. 2d 1002, 367 N.Y.S.2d 686 (Sup. Ct. 1975).

⁵ N. Y. Pub. Health Law Article 43, §§ 4301-4307 (1977).

⁶ *New York City Health & Hosp. Corp. v. Sulsona*, 81 Misc. 2d 1002, 367 N.Y.S.2d 686, 691 (Sup. Ct. 1975).

definition was applicable in her court only; furthermore, it would be limited to potential donors from whom organs were to be removed upon death, under the procedures defined in the anatomical gift law. The judge urged the legislature to remedy the situation immediately.

The "definition" of death has also arisen in civil cases not involving organ transplantation. For example, a large body of law concerning the time of death in inheritance cases has provided a major focus of the "existing law" defining death. Recently, the question of whether respiratory support is being given to a live patient or a dead body has been presented a number of times¹ but has been decided by the highest court of a state in only one case, *In re Bowman*.² Late in 1980, the Supreme Court of Washington affirmed a lower court's ruling that a person without any brain functions is dead. Five year-old Matthew Bowman had suffered massive physical injuries from a nonfamily member who was caring for him. He was admitted to the hospital in critical condition and placed under the guardianship of the Department of Social and Health Services. When his natural parents were located, Matthew's court-appointed guardian objected to being dismissed on the ground that the parents would order the withdrawal of the respirator and other medical care supporting Matthew.

Although it ruled that Matthew was dead, the trial court enjoined the removal of the "extraordinary measures" sustaining respiration and heartbeat, pending an appeal. The case was set down for argument before the state's highest court a week later, but a day before the argument was scheduled all of Matthew's bodily functions ceased irretrievably.

Since the issue was of such importance, the Washington Supreme Court decided to rule on it even though the particular case had become technically moot upon Matthew Bowman's death.³ The Washington Supreme Court reviewed the medical findings and the attending physician's conclusion that "Matthew's brain was dead under the most rigid criteria available, called the 'Harvard criteria,' and that his cardiovascular system would, despite the life support systems, fail in 14 to 60 days."⁴ The physician also cited the

¹ People v. Lyons, 15 Crim. L. Rptr. 2240 (Cal. Super. Alameda Co. 1974); Cranmore v. State, 271 N.W.2d 402 (Wis. App. 1978).

² *In re Bowman*, 617 P.2d 731 (Wash. Sup. Ct. 1980).

³ *Id.* at 734; Sorenson v. Bellingham, 80 Wash. 2d 547, 496 P.2d 512 (1972).

⁴ *In re Bowman*, 617 P.2d 731, 733 (Wash. Sup. Ct. 1980).

agreement of "all physicians in the Children's Orthopedic Hospital intensive care unit. . . that Matthew was no longer alive"¹ at the time of the hearing, and conveyed their recommendation, to which Matthew's mother consented, that he be removed from the ventilator.

As in the Colorado decision,² the Washington court decided that the failure of the state legislature to adopt the new standard did not pose a barrier to judicial recognition of such a formula. In the year that had passed since the *Lovato* decision in Colorado, the statute recommended in the present Report had been taken for approval to the uniform law commissioners. The Commissioners approved it in August 1980 in place of the Uniform Brain Death Act embraced in *Lovato*.³ Accordingly, the Washington court in *Bowman* "adopted" the provisions of the Uniform Determination of Death Act while explicitly leaving to the medical profession the definition of "acceptable diagnostic tests and medical procedures. . . taking into account new knowledge of brain function and new diagnostic procedures."⁴

III. Statutory Construction

Finally, a few cases have arisen in states having a statutory "definition" of death, in which the courts have had to interpret the meaning of the statutes as applied to a particular set of facts. For the most part the statutes have fared well: they have been upheld and have been interpreted in a straightforward and biomedically appropriate fashion. Peculiarities of the statutes in two states led to odd outcomes in two cases, however, and point to conclusions that ought to enter into the thinking of those who draft statutes.

A. Cases Upholding Statutes

In *State v. Shaffer*,⁵ the landmark Kansas statute was challenged. Shaffer, convicted of first degree murder, claimed the statute was never intended to apply to criminal homicide trials and that the instruction given to the jury pursuant to the statute was thus erroneous. The court held that it is proper in a criminal trial to instruct the jury on the statute as the basis for determining when death occurs. The court also held that the Kansas statute when applied to murder in the first degree is not unconstitutionally vague in allowing either of two standards to be applied to determine death. The Court found the alternative brain-based standard to the traditional cardiopulmonary standard to be grounded

¹ *Id.*

² *Lovato v. District Court*, 601 P.2d 1072 (Colo. 1979) (en banc).

³ Colo. Rev. Stat. § 12-36-136 (1981).

⁴ *In re Bowman*, 617 P.2d 731, 738 (Wash. Sup. Ct. 1980).

⁵ *State v. Shaffer*, 223 Kan. 244, 574 P.2d 205 (1977).

on sound considerations in keeping with advanced medical technology. It found no constitutional requirement that a single standard be used. Nor was the statute unconstitutionally vague for failure to enumerate procedures for determining when death has occurred. A determination based on the "ordinary standards of medical practice" was held sufficient.

The court also relied upon the "proximate cause" theory of criminal responsibility. It held that if the defendant has caused wounds to be inflicted on the victim, and if the jury found that those wounds contributed to the death of the victim, the defendant could not avoid responsibility by showing that the treating physicians had turned off the respirator and transplanted the victim's kidneys.

Similarly, in *People v. Vanderford*,¹ the Capron-Kass statute adopted in Michigan² withstood challenge by a criminal defendant. Convicted of involuntary manslaughter, the appellant challenged the Michigan statute as unconstitutionally vague or not sufficiently rigorous. He claimed that death might have been caused by the respirator having been *prematurely* terminated (*i.e.*, because a patient who was actually alive had been incorrectly declared dead under the statute).

The Michigan court held the defendant was not in a position to challenge the statute. First, he had no personal interest in the constitutionality of the statute since, even if it were found unconstitutional, his conviction would stand because Michigan also employs the usual legal rule that intervening medical error is not a defense when the accused has inflicted a mortal wound upon another. Second, Vanderford was held not to have standing to attack the statute on the ground that its application might deny the constitutional rights of another.

The defendant's claim that the trial court should have instructed the jury that death must be pronounced before artificial life support systems are terminated was found by the Michigan court to be without merit, since the time at which death was pronounced, either before or after the life support system is terminated, is not material to his guilt.

In *North Carolina v. Holsclaw*³, the court held the "brain death" provisions of the state's 1977 Natural Death Act irrelevant to a homicide case where a determination had to be made as to the proximate cause of death. In a

¹ *People v. Vanderford*, 77 Mich. App. 370, 258 N.W.2d 502 (1977).

² Mich. Stat. Ann. § 14.15 (1021 to 1024) (Cum. Supp. 1981).

³ *North Carolina v. Holsclaw*, 42 N.C. App. 696, 257 S.E.2d 650 (1979).

criminal prosecution, the North Carolina court held, an intervening cause of death must be the sole cause in order to release the criminal defendant from responsibility for murder. It was held to be a jury function to resolve the issue of proximate cause involved in the determination of "brain death" and termination of life supports.

B. Cases Demonstrating Some Problems with the Statutes

The first serious problem with a statutory "definition" of death arose in a 1979 Maryland case interpreting a statute patterned on the original legislation in Kansas. In *State v. Robaczynski*¹ a Baltimore nurse was tried for murdering a 48 year-old comatose cardiac patient by disconnecting his respirator.

Although the case initially appeared to be one of "mercy killing," at trial the defense contended that the patient was actually "brain dead" before Ms. Robaczynski "pulled the plug." The state's evidence, supplied by the victim's cardiologist and by the medical examiner who conducted the autopsy, was that his brain was functioning (and his general condition was improving) at the time the respiratory support was withdrawn, causing his heart to fail completely within 25 minutes.²

After three days of deliberation the jury was unable to reach a verdict and a mistrial was declared.³

Reports revealing the trouble the jurors had in reaching a verdict are instructive. In Maryland the jury is the arbiter of the law as well as the facts in criminal cases and thus was left on its own to interpret the statute.⁴ Interviews with the jurors revealed that their inability to reach a verdict hinged on the interpretation of the word "spontaneous" in the Maryland law which lists the "irreversible cessation of spontaneous brain function" as one standard for determining death.⁵

¹ *State v. Robaczynski*, No.5 78-23001 (Criminal Court of Baltimore, 1979).

² Alexander Morgan Capron, "Death and the Law: A Decade of Change," 63 *Soundings* 290, 304-05 (1980).

³ Saundra Saperstein, "Maryland Law on Brain Death Was Unclear to Jurors," March 21, 1979, *Wash. Post*, § C at 1, col. 1; Saundra Saperstein, "Md. Nurse to be Freed of Charges: Law Defining Death Held Too Ambiguous," March 29, 1979, *Wash. Post*, § B at 1, col. 6.

⁴ Md. Canst. art. 23.; *Wyley v. Warden*, 372 F.2d 742 (4th Cir.), *cert. denied*, 389 U.S. 863 (1967).

⁵ Md. Ann. Code art. 43, § 54F(a)(b) (1980); Millard Bass, "Definition of Brain Death," (letter to editor) 242 *J.A.M.A.* 1850 (1979).

The word "spontaneous" as related to brain function apparently was intended to have a meaning analogous to its use in the context of circulation and respiration—that is, an inherent rather than artificially maintained function. But since the heart and lungs can be maintained artificially by a respirator, while brain activity cannot likewise be supported with artificial technology, the use of "spontaneous" as a modifier of "brain functions" was unnecessary and, as it turned out, confusing. Defense testimony was introduced to show that under the accepted medical tests upon which the prosecution was relying to show that the victim had still been alive, his brain activity was not manifested *spontaneously* but would have had to be evoked by the application of external stimuli. Thus, confusion was established between the legal meaning of the word spontaneous (*i.e.* inherent v. artificially maintained) and the medical use of the word (manifested without intervention v. apparent only upon stimulation). Unable to reconcile the two, the jury was stymied.

After the mistrial, the prosecuting attorney, William A. Swisher, declined to retry Ms. Robacynski. The initial charge and three similar ones were dropped in exchange for the return of her Maryland nurse's license and her promise to forego the practice of nursing. Newspaper accounts quoted Swisher as saying, "The law should be clarified. We need an acceptable universal definition of death."¹

The second serious problem in statutory interpretation appeared in a Connecticut case. Commentators on statutes "defining" death have long argued against attaching such statutes to special purpose legislation—such as the laws on organ transplantation—lest a special category of "death" be created. In enacting statutes on the determination of death, state legislatures have overwhelmingly heeded this advice. The unfortunate consequences of a special transplantation-only "definition" of death manifested themselves earlier this year in a case in Connecticut, one of the two states to have made its statute on death a part of its organ transplantation law.

On January 30, 1981, Melanie Bacchiodi suffered a cardiac arrest while having her wisdom teeth removed under general anesthesia.² After resuscitation she was admitted to a Stafford, Connecticut hospital. By February 11, her physician and consultants found her to have suffered

¹ T. Humphrey, "Md. Drops Euthanasia Charges," March 30, 1979, *Phila. Inquirer* at 7 A, col. 1.

² Fred Fabro, "Bacchiodi vs. Johnson Memorial Hospital," 45 *Conn. Med.* 267 (1981); Fred Fabro, "The Bacchiodi Case-Continued" 45 *Conn. Med.* 334 (1981).

total, irreversible loss of the functions of her entire brain, including the brain stem. In the physician's view, his patient had died. Thus, it was no longer appropriate to continue treatment (estimated to cost \$1,000 per day) that should be made available instead for those whom it might benefit.

Nevertheless, Ms. Bacchiodchi's doctor refused to remove her from the respirator unless he was granted immunity from prosecution by the Chief State's Attorneys Office. His request was supported by the hospital's attorney. Since Connecticut's statute recognizing "brain death" had been adopted in 1979 as part of the State's Uniform Anatomical Gift Act, its application is limited to potential organ donors—a group into which Ms. Bacchiodchi did not fall.

Ms. Bacchiodchi's family brought suit to have her removed from the respirator. Four days of court hearings, attended by attorneys representing at least eight different parties, were held before Judge Harry Hammer of the Hartford/New Britian Superior Court.

Although Judge Hammer declined to bring the general common law on death into line with the statutory law on organ donors or, indeed, to issue any formal ruling in the case, the Assistant State's Attorney stated informally that he had no intention of prosecuting. Reassured, Ms. Bacchiodchi's doctor removed her respirator on March 13, 1981, and the artificially-supported cardiopulmonary functions ceased. The irony of the Bacchiodchi case is that had she been an organ donor, she could have been declared dead under Connecticut law and removed from the respirator on February 11. Furthermore, the prosecutor stated that his position in *Bacchiodchi* was limited to the facts of that case and would not preclude prosecution of physicians or others for actions they take in any future "brain death" cases.

International Rules E

Argentina

The law on determination of death in Argentina is found in a 1977 statute¹ related to the donation and transplantation of organs. It provides for a determination of death when "all brain functions have totally and irreversibly ceased." Certification of death of a transplant donor is to be made by a team of experts consisting of a general practitioner, a neurologist or neurosurgeon and a cardiologist, none of whom are members of the team that will perform the operation on either the donor or recipient.

Regulations pursuant to the 1977 statute require that all of the following confirmatory tests be performed:²

1. Total absence of response of any kind to external stimuli, especially to those of a nociceptive nature applied above the occipital orifice.

2. Electroencephalographs on patients not intoxicated and those not affected by hypothermia, with the observance of the following requirements:

a) Flat lineal reading with no bioelectrical response to several sensitive-sensorial stimuli applied during the test.

b) Utilization of at least eight electrodes at a minimum interelectrode distance of at least eight centimeters.

c) Setting of the equipment at its maximum capacity of amplification (up to 25 microvolts per 1 centimeter).

d) Time constant of 0.3.

¹ Law 21, 541 of March 2, 1977, *Boletin Oficial* [B.D.] March 18, 1977, art. 21.

² Decree 30011 of October 3, 1977, *Boletin Oficial* [B.D.] October 13, 1977, art. 21.

- e) Registry of a minimum duration of fifteen minutes with repetition after six hours.
- 3. Lack of spontaneous breathing, with the absolute necessity of an artificial respirator.
- 4. Fixed mydriatic pupils or pupils in an intermediate position despite the use of intense photic stimuli to observe pupillary reactivity.
- 5. Lack of oculocephalic reflexes during the passive cephalic rotations.
- 6. Vestibular caloric tests. After otological examination, irrigate with a clyster tube each external duct with 200 cubic centimeters of iced water in an alternated manner, and with a ten-minute interval between each irrigation. There should be no ocular movements during and at the end of the test.
- 7. Atropine test. Inject two to four milligrams of atropine intravenously observing for possible changes on the electrocardiogram. There should be no acceleration of the cardiac frequency during the test. This observation should last no less than six minutes.
- 8. When tests 4, 5, and 6, above, may not be conducted because of severe ocular lesions, it shall be required that tests leading to a certification of the total lack of cerebral circulation be conducted for no less than thirty minutes.

Australia

In an extensive 1977 report entitled "Human Tissue Transplants"¹ the Law Reform Commission of Australia recommended a statute which was adopted in the following fashion by the Northern Territory of Australia and the Australian Capital Territory.

For the purpose of the law of the Territory, a person has died when there has occurred—

- (a) irreversible cessation of all function of the brain of the person; or
- (b) irreversible cessation of circulation of blood in the body of the person.

The following recommendations accompanied the Law Reform Commission's statute:

The Commission offers a number of comments on the recommended provision. Flexibility to allow adoption of criteria to accord with the best current professional procedures is preferable to verbose legislation. The brevity of the recommended statutory provision, and the deliberate omission of detailed criteria, may be taken as a reflection and

¹ The Law Reform Commission of Australia, *Human Tissue Transplants* (Report No.7) Australian Government Publishing Service, Canberra (1977).

confirmation of the Australian community's general confidence in the medical profession. The creation and prescription of techniques of diagnosis should be the responsibility of the medical profession. Thirdly, although appearing in this context of transplantation, the recommended statutory definition of death is intended to have general application. It should not be limited in its legal effect to any particular kind of patient, nor to patients maintained by support machinery (although, in practice it will no doubt principally, if not exclusively, affect only such patients), nor to transplantation. The inclusion in the statutory provision of references both to "brain death" and to traditional criteria serves a useful purpose. Despite the greater accuracy of determining death by reference to cessation of brain function, it is clear that in most cases, death will be certified or determined according to the traditional respiratory-circulatory-cardiac standards. There will not be a great number of cases in which the need and facilities for, and opportunity of, employing the necessary "brain death" criteria will be present.

Canada

There is no Canadian federal case or statutory law on the subject of the use of brain-oriented criteria to determine death. However, in response to a 1974 report by the Manitoba Law Reform Commission, the Province of Manitoba enacted the following statute (the only province to do so):

For all purposes within the legislative competence of the Legislature of Manitoba, the death of a person takes place at the time at which irreversible cessation of all that person's brain function occurs.

More recently, as part of a series of reports in its "Protection of Life Project" which began in 1976, the Law Reform Commission of Canada issued a report, the "Criteria for the Determination of Death" (Working Paper No. 23). The Commission recommended that the following statute be adopted as federal statutory law by way of an amendment to the Interpretation Act of 1970:

- (1) A person is dead when an irreversible cessation of all that person's brain functions has occurred.
- (2) The cessation of brain functions can be determined by the prolonged absence of spontaneous cardiac and respiratory functions.
- (3) When the determination of the absence of cardiac and respiratory functions is made impossible by the use of artificial means of support, the cessation of the brain functions may be determined by any means recognized by the ordinary standards of current medical practice.

In drafting the statute the Commission noted the following series of objectives:

- (1) The proposed legislation must avoid arbitrariness and give greater guidance to doctors, lawyers and the public, while remaining flexible enough to adapt to medical changes.
- (2) The proposed legislation must not attempt to solve all the problems created by death, but only the problem of establishing criteria for its determination.
- (3) The one proposed piece of legislation must apply equally in all circumstances where a determination of death is at issue.
- (4) The proposed legislation must recognize only the standards and criteria of death; it must not define the medical procedure to be used, nor the instruments or procedures by which death is to be determined.
- (5) The proposed legislation must recognize standards and criteria generally accepted by the Canadian public.
- (6) To remain faithful to the popular concept, the proposed legislation must recognize that death is the death of an individual person, not of an organ or cells.
- (7) The proposed legislation must not in practice lead to wrong or unacceptable situations.
- (8) The proposed legislation must not determine the criteria of death by reference only or mainly to the practice of organ transplantation.

Czechoslovakia

Criteria for the determination of death can be found in a directive entitled "Extraordinary Removal of Tissues and Organs from Dead Bodies" which was promulgated by the Ministry of Health of the Czech Socialist Republic and took effect on April 1, 1978.

Artificial respiration support may be given up after diagnosis of death of the brain when the following criteria are complied with:

- a) deep coma with total unreceptivity to internal or external stimuli
- b) no muscular reflexes
- c) no vegetative reflexes
- d) lack of spontaneous respiration
- e) angiography by contrast material which does not penetrate to the brainstem, visualizing only the extra cranial sections of those arteries that supply blood to the brain [angiography is to be done twice with a thirty minute interval; or an isoelectric electroencephalogram is to be done three times within twenty four hours]

Finland

Act Number 260 of July 8, 1957 entitled "The Use of Tissues of a Dead Person for Therapeutic Purposes, "includes the following provisions:

The removal of tissues must not be begun until the corpse shows unmistakable signs of death. The National Board of Health decides how death shall be determined before the removal of tissues referred in this act.

Regulations pursuant to the above act were promulgated in 1971 by Finland's national board of health. (Reg. No. 10063. 1969. S).

I Place of venue

* * * *

II Ascertaining death

Death has to be ascertained by the appropriate chief physician, or by another hospital physician, who has a written authorization from the chief physician. The physician who has ascertained the death shall not participate in the transplantation of tissues.

III The grounds for ascertaining death

Before tissues are removed, the following signs of death, as referred to in subsection 2 of section 1 of the above Act, must be present:

—permanent cessation of the activity of the brain or of the heart; as specified in detail in subsections 1) and 2) below. It is assumed that all therapy required by the patient under the circumstances has been carried out. A person is dead when his or her brain is so damaged that the vital functions of the brain have ceased regardless whether the heart has stopped or not;

or:

—secondary signs of death such as postmortem lividity, cooling of the body and rigor mortis (subsection 3).

1) Permanent cessation of functions of the brain

The underlying cause of brain death must be known with absolute certainty. If the cause of the brain damage is a condition leading to raised intracranial pressure (e.g. a severe brain injury, an intracranial hemorrhage, a brain tumor), the permanent cessation of the functions of the brain is ascertained as follows:

- a) the pupils are permanently dilated, with no reaction to light;
- b) spontaneous breathing has stopped and does not start after $\frac{1}{2}$ – 1 hour of efficient artificial respiration;
- c) cranial nerves show no reaction.

In other cases, and if there remains the slightest doubt about brain death, further examinations must be carried

out, such as electroencephalogram, cerebral angiography, etc. For the electroencephalogram, at least a 6-channel recording with needle electrodes is required. The electroencephalogram must be isoelectric, nor must there be noise impairing the assessment of isoelectricity, nor must there be any response to any stimuli.

In childhood, in hypothermia and in acute intoxication the lack of electrical activity of the brain is not a reliable sign of death.

2) Permanent cessation of the heart beat

The absence of the heart beat is not in itself a sign of death. If all therapeutic and resuscitating measures required by the condition of the patient and by the circumstances have been carried out, the patient is considered dead when the vital functions of the brain have irrevocably stopped. If the asystolic heart cannot be made to function effectively after ½ – 1 hour of resuscitation, the signs of death apply as set out in subsections 1), a to c.

3) Secondary signs of death,

such as post mortem lividity, cooling of the body and rigor mortis are not applicable if organs are to be removed for transplantation. However, tissues such as skin and cornea may still be removed. In the latter case it is sufficient that the physician in charge has certified the death.

France

French law contains no legal definition of death as such; however, there are several provisions establishing the occurrence of death which are given by the Decree of October 20, 1947, and the Law of July 7, 1949. These two provisions stipulate that death must be established by two physicians who must use all the means which are recognized to be valid by the Ministry of Public Health to make certain that death has, indeed, occurred.¹

France recognizes the criteria adopted by the Scientific Conference of the World Health Organization held in Geneva from June 13-14, 1968.

1. loss of all vital signs of life;
2. complete areflexy and atony of the muscles;
3. complete halt of spontaneous breathing;
4. complete pulse arrest, if not artificially stimulated;
and
5. an absolutely linear electroencephalographic drawing.²

¹ Repertoire de droit penal Medicine, 21 (Paris, Dalloz, 1978).

² *Id.*

The memoranda issued by the French Ministry of Public Health on February 3, 1948, September 19, 1958, and April 25, 1968, also require, besides and in addition, the use of the following direct examinations:

1. arteriotomy;
2. a fluorescein test; and
3. an absolutely linear electroencephalogram for a sufficient time.¹

Documents published by the Ministry of Health in April 1968 endorsed criteria close to those adopted by the Harvard school.²

Great Britain

Although there is no official legal definition of death in Great Britain the issue has been addressed in an October 1979 pamphlet entitled "The Removal of Cadaveric Organs for Transplantation: A Code of Practice." This code was drafted by a working party under the aegis of the Health Department of Great Britain and Northern Ireland as a guide for hospital practice. It states:

There is no legal definition of death. Death has traditionally been diagnosed by the irreversible cessation of respirator and heart beat. This working party accepts the view held by the Conference of Royal Colleges that death can also be diagnosed by the irreversible cessation of brains stem function—"brain death." In diagnosing brain death the criteria laid down by the Colleges should be followed.

It is sometimes necessary to carry out the diagnostic tests on more than one occasion. As a patient must be presumed to be alive until it is clearly established that he is dead, the time of death should be regarded as the time when death was conclusively established, not some earlier or a later time when artificial ventilation is withdrawn, or the heartbeat ceases.

The following are some excerpts from the paper produced by the Conference of Royal Colleges and Faculties of the United Kingdom which is included by reference in the Working Party document³ (Some explanatory notes have been deleted.)

¹ *Id.*

² Law Reform Commission of Canada Working Paper 23 Criteria for the Determination of death, 1979.

³ Conference of Medical Royal Colleges and Faculties of the United Kingdom "Diagnosis of Brain Death" ii Lancet 1069 (1970).

Conditions under which the Diagnosis of Brain Death should be considered

1. The patient is deeply comatose.
 - (a) There should be no suspicion that this state is due to depressant drugs.
 - (b) Primary hypothermia as a cause of coma should have been excluded.
 - (c) Metabolic and endocrine disturbances which can be responsible for or can contribute to coma should have been excluded.
2. The patient is being maintained on a ventilator because spontaneous respiration had previously become inadequate or had ceased altogether.
 - (a) Relaxants (neuromuscular blocking agents) and other drugs should have been excluded as a cause of respiratory inadequacy or failure.
3. There should be no doubt that the patient's condition is due to irremediable structural brain damage. The diagnosis of a disorder which can lead to brain death should have been fully established.

Diagnostic tests for the confirmation of Brain Death

All brainstem reflexes are absent:

- (i) The pupils are fixed in diameter and do not respond to sharp changes in the intensity of incident light.
- (ii) There is no corneal reflex.
- (iii) The vestibulo-ocular reflexes are absent.
- (iv) No motor responses within the cranial nerve distribution can be elicited by adequate stimulation of any somatic area.
- (v) There is no gag reflex or reflex response to bronchial stimulation by a suction catheter passed down the trachea.
- (vi) No respiratory movements occur when the patient is disconnected from the mechanical ventilator for long enough to ensure that the arterial carbon dioxide tension rises above the threshold for stimulation of respiration.

Other considerations**1. Repetition of Testing**

It is customary to repeat the tests to ensure that there has been no observer error. The interval between tests must depend upon the primary pathology and the clinical course of the disease. The interval between tests depends upon the progress of the patient and might be as long as 24 hours. This is a matter for medical judgement and repetition time must be related to the signs of improvement, stability, or deterioration which present themselves.

It is now widely accepted that electroencephalography is not necessary for the diagnosis of brain death. Electroen-

cephalography has its principal value at earlier stages in the care of patients, in whom the original diagnosis is in doubt. When electroencephalography is used, the strict criteria recommended by the Federation of E.E.G. Societies must be followed.

Other investigations such as cerebral angiography or cerebral bloodflow measurements are not required for the diagnosis of brain death.

Greece

The law establishing the definition of death in Greece is found in Article 9 of Law No. 821 of October 14, 1978, a statute entitled "Concerning the Removal and Transplantation of Biological Substances of Human Origin."

(1) Any activity undertaken on the corpse for the removal of biological material is forbidden as long as it has not been previously established that the individual is dead. For the purpose of implementation of the provisions of the present law, an individual is considered dead when doctors establish, according to the provisions of paragraph two and through established and indisputable scientific methods, that there exist signs indicating the definite (irrevocable) termination of the functioning of the central nervous system, independently of the time of appearance and duration of presence of such signs and including indispensably all of the following signs:

- a) Termination of automatic and provoked movements.
- b) Termination of reflexes, and especially of the cornea.
- c) Mydriasis and lack of any reaction of the eye pupil.
- d) The lack of appearance of respiratory motion after an experimental interruption of the operation of the resuscitation apparatus, provided that the individual is connected to one, for a period of time sufficient to cause automatic respiratory motion as a result of the accumulation of carbon dioxide.
- e) Electroencephalographic silence.
 - (1) Artificial prolongation of the functioning of certain isolated organs of systems cannot place in doubt the ascertainment of death according to the above criteria, nor does it suspend the undertaking of removal of biological material.
 - (2) The ascertainment of death according to the previous paragraph is done by two doctors practicing medicine for at least five years; one of these two doctors must be a neurology specialist.

Neither of the ascertaining doctors is allowed to have a relationship with any scientific team interested in and occupied with transplantation.

Norway

Regulations regarding the definition of death were promulgated by Royal Decree in June of 1977 pursuant to Act No. 6 of February 1973, "Transplantation, Hospital Autopsies and Donation of Bodies."

It is the cessation of brain function which decides that continued life is not possible. A universally valid definition of death must therefore be based on the fact that brain function has ceased.

The following definition shall be the basis of the diagnosis of death:

Death has taken place when there is total destruction of the brain with complete and permanent cessation of all functions in the cerebrum, the cerebellum and the brainstem (mesencephalon, pons and medulla oblongata).

This definition of death is of universal validity and covers all causes of death.

The signs of the total destruction of the brain are either permanent cessation of heartbeat and respiration or the following criteria which must be satisfied if heartbeat and respiration are artificially maintained.

Recognized intracranial pathological process

Total destruction of the brain occurs if the pressure inside the cavity of the skull rises to the same level as the blood pressure, so that the blood supply to the brain ceases. The rise of pressure in the cavity of the skull is caused by space-consuming pathological processes and/or swelling of the brain (i.e. brain edema or an increase of fluid content in the brain).

The destruction of the brain may be due to disease or injury inside the cavity of the skull itself, such as hemorrhages, abscesses, inflammations and head injuries (primary causes) or disease or injury outside the cavity of the skull which lead to lack of oxygen in the brain (secondary causes).

Total unconsciousness

Here there must be failure to react to light, sound, touch and pain-producing stimuli. The spinal cord—which lies outside the cavity of the skull—may have reflex functions even if the brain in its entirety has been destroyed. Spinal cord reflexes (i.e. muscle contractions in response to tapping of the sinews) may therefore be present, even if death has occurred.

Cessation of own respiration

This is an absolute requirement for the diagnosis of death.

Cessation of all brain nerve reflexes

Reflexes which pass the brain stem—which lies in the cavity of the skull—must not be able to be obtained: the pupils must not react to light, the corneal reflex (movement of the eyeball following the injection of cold water into the auditory canal) must not be able to be produced.

Cessation of the electrical activity of the brain

An isoelectrical or "flat" electroencephalogram is usually an indication of the total destruction of the brain. On its own the EEG examination is not sufficient proof that the brain has been totally destroyed, because in cases of poisoning by soporific drugs and narcotics, of low body temperature (hypothermia) or of acute lack of oxygen patients may temporarily have an isoelectrical electroencephalogram. If radiological examination (cerebral angiography, see under next heading) has already shown that the blood supply to the brain has ceased, the EEG examination may be omitted.

Cessation of blood supply to the brain demonstrated by cerebral angiography

Confirmation by angiography that the blood supply to the brain has ceased is the decisive indication of total destruction of the brain. The injection of contrast medium must be made into all four arteries which carry blood to the brain, namely both arteries of the neck (the carotid arteries) and both arteries of the cervical vertebrae (the vertebral arteries).

If the injection of contrast medium in both the carotid arteries has shown that neither of these is carrying blood to the brain, it is sufficient to make an injection of contrast medium into one of the vertebral arteries if the contrast medium flows back in the other without the veins in the cavity of the skull being filled with contrast medium.

The blood pressure must be measured before, during and after the radiological examination, so that it is certain that the absence of contrast medium in the veins in the brain is not due to a fall in blood pressure during the actual examination. If the blood pressure falls while the examination is being carried out, it must be repeated with a stabilized blood pressure.

CONCLUSION

If all the criteria 1-6 are satisfied, the patient shall be declared dead.

Spain

Spain recognized brain-based criteria for determining death in its Law 30 of October 27, 1979¹

¹ *Boletin Oficial [B.O.]*, November 6, 1979.

Art. 5. The extraction of organs or of any other anatomical parts of deceased persons may be made after the death of that person has been attested to. When the attestation is based on the existence of data concerning the irreversibility of cerebral damage, and therefore, incompatible with life, the death certificate shall be subscribed by three doctors, among whom will be one neurologist or neurosurgeon and the chief of the corresponding medical unit, or his or her substitute. None of these physicians may favor part of the team that will use the organ(s) or make the transplant.

Guidelines for the Determination of Death

F

Report of the Medical Consultants on the Diagnosis of Death to the President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research *

* The guidelines set forth in this report represent the views of the signatories as individuals; they do not necessarily reflect the policy of any institution or professional association with which any signatory is affiliated. Although the practice of individual signatories may vary slightly, signatories agree on the acceptability of these guidelines: Jesse Barber, M.D., Don Becker, M.D., Richard Behrman, M.D., J.D., Donald R. Bennett, M.D., Richard Beresford, M.D., J.D., Reginald Bickford, M.D., William A. Black, M.D., Benjamin Boshes, M.D., Ph.D., Philip Braunstein, M.D., John Burroughs, M.D., J.D., Russell Butler, M.D., John Caronna, M.D., Shelley Chou, M.D., Ph.D., Kemp Clark, M.D., Ronald Cranford, M.D., Michael Earnest, M.D., Albert Ehle, M.D., Jack M. Fein, M.D., Sal Fiscina, M.D., J.D., Terrance G. Furlow, M.D., J.D., Eli Goldensohn, M.D., Jack Grabow, M.D., Phillip M. Green, M.D., Ake Grenvik, M.D., Charles E. Henry, Ph.D., John Hughes, M.D., Ph.D., D.M., Howard Kaufman, M.D., Robert King, M.D., Julius Korein, M.D., Thomas W. Langfitt, M.D., Cesare Lombroso, M.D., Kevin M. McIntyre, M.D., J.D., Richard L. Masland, M.D., Don Harper Mills, M.D., J.D., Gaetano Molinari, M.D., Byron C. Pevehouse, M.D., Lawrence H. Pitts, M.D., A. Bernard Pleet, M.D., Fred Plum, M.D., Jerome Posner, M.D., David Powne, M.D., Richard Rovit, M.D., Peter Safar, M.D., Henry Schwartz, M.D., Edward Schlesinger, M.D., Roy Selby, M.D., James Snyder, M.D., Bruce F. Sorenson, M.D., Cary Suter, M.D., Barry Tharp, M.D., Fernando Torres, M.D., A. Earl Walker, M.D., Arthur Ward, M.D., Jack Whisnant, M.D., Robert Wilkus, M.D., and Harry Zimmerman, M.D.

The preparation of this report was facilitated by the President's Commission but the guidelines have not been passed on by the Commission and are not intended as matters for governmental review or adoption.

Foreword

The advent of effective artificial cardiopulmonary support for severely brain-injured persons has created some confusion during the past several decades about the determination of death. Previously, loss of heart and lung functions was an easily observable and sufficient basis for diagnosing death, whether the initial failure occurred in the brain, the heart and lungs, or elsewhere in the body. Irreversible failure of either the heart and lungs or the brain precluded the continued functioning of the other. Now, however, circulation and respiration can be maintained by means of a mechanical respirator and other medical interventions, despite a loss of all brain functions. In these circumstances we recognize as dead an individual whose loss of brain functions is complete and irreversible.

To recognize reliably that death has occurred, accurate criteria must be available for physicians' use. These now fall into two groups, to be applied depending on the clinical situation. When respiration and circulation have irreversibly ceased, there is no need to assess brain functions directly. When cardiopulmonary functions are artificially maintained, neurologic criteria must be used to assess whether brain functions have irreversibly ceased.

More than half of the states now recognize, through statutes or judicial decisions, that death may be determined on the basis of irreversible cessation of all functions of the brain. Law in the remaining states has not yet departed from the older, common law view that death has not occurred until "all vital functions" (whether or not artificially maintained) have ceased. The language of the statutes has not been uniform from state to state, and the diversity of proposed and enacted laws has created substantial confusion. Consequently, the American Bar Association, the American Medical Association, the National Conference of Commissioners on Uniform State Laws, and the President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research have proposed the following model statute, intended for adoption in every jurisdiction:

Uniform Determination of Death Act

An individual who has sustained either (1) irreversible cessation of circulatory and respiratory functions, or (2) irreversible cessation of all functions of the entire brain, including the brain stem, is dead. A determination of death must be made in accordance with accepted medical standards.

This wording has also been endorsed by the American Academy of Neurology and the American Electroencephalographic Society.

The statute relies upon the existence of "accepted medical standards" for determining that death has occurred. The medical profession, based upon carefully conducted research and extensive clinical experience, has found that death can be reliably determined by either cardiopulmonary or neurologic criteria. The tests used for determining cessation of brain functions have changed and will continue to do so with the advent of new research and technologies. The "Harvard criteria" (JAMA, 205:337, 1968) are widely accepted, but advances in recent years have led to the proposal of other criteria. As an aid to the implementation of the proposed uniform statute, we provide here one statement of currently accepted medical standards.

Introduction

The criteria that physicians use in determining that death has occurred should:

- (1) Eliminate errors in classifying a living individual as dead,
- (2) Allow as few errors as possible in classifying a dead body as alive,
- (3) Allow a determination to be made without unreasonable delay,
- (4) Be adaptable to a variety of clinical situations, and
- (5) Be explicit and accessible to verification.

Because it would be undesirable for any guidelines to be mandated by legislation or regulation or to be inflexibly established in case law, the proposed Uniform Determination of Death Act appropriately specifies only "accepted medical standards." Local, state, and national institutions and professional organizations are encouraged to examine and publish their practices.

The following guidelines represent a distillation of current practice in regard to the determination of death. Only the most commonly available and verified tests have been included. The time of death recorded on a death certificate is at present a matter of local practice and is not covered in this document.

These guidelines are advisory. Their successful use requires a competent and judicious physician, experienced in clinical examination and the relevant procedures. All periods of observation listed in these guidelines require the patient to be under the care of a physician. Considering the responsibility entailed in the determination of death, consultation is recommended when appropriate.

The outline of the criteria is set forth below in capital letters. The indented text that follows each outline heading explains its meaning. In addition, the two sets of criteria (cardiopulmonary and neurologic) are followed by a pre-

sentation of the major complicating conditions: drug and metabolic intoxication, hypothermia, young age, and shock. It is of paramount importance that anyone referring to these guidelines be thoroughly familiar with the entire documents, including explanatory notes and complicating conditions.

The Criteria for Determination of Death

An individual presenting the findings in either section A (cardiopulmonary) or section B (neurologic) is dead. In either section, a diagnosis of death requires that both cessation of functions, as set forth in subsection 1, and irreversibility, as set forth in subsection 2, be demonstrated.

A. AN INDIVIDUAL WITH IRREVERSIBLE CESSATION OF CIRCULATORY AND RESPIRATORY FUNCTIONS IS DEAD.

1. *CESSATION* IS RECOGNIZED BY AN APPROPRIATE CLINICAL EXAMINATION.

Clinical examination will disclose at least the absence of responsiveness, heartbeat, and respiratory effort. Medical circumstances may require the use of confirmatory tests, such as an ECG.

2. *IRREVERSIBILITY* IS RECOGNIZED BY PERSISTENT CESSATION OF FUNCTIONS DURING AN APPROPRIATE PERIOD OF OBSERVATION AND/OR TRIAL OF THERAPY.

In clinical situations where death is expected, where the course has been gradual, and where irregular agonal respiration or heartbeat finally ceases, the period of observation following the cessation may be only the few minutes required to complete the examination. Similarly, if resuscitation is not undertaken and ventricular fibrillation and standstill develop in a monitored patient, the required period of observation thereafter may be as short as a few minutes. When a possible death is unobserved, unexpected, or sudden, the examination may need to be more detailed and repeated over a longer period, while appropriate resuscitative effort is maintained as a test of cardiovascular responsiveness. Diagnosis in individuals who are first observed with rigor mortis or putrefaction may require only the observation period necessary to establish that fact.

B. AN INDIVIDUAL WITH IRREVERSIBLE CESSATION OF ALL FUNCTIONS OF THE ENTIRE BRAIN, INCLUDING THE BRAINSTEM, IS DEAD.

The "functions of the entire brain" that are relevant to the diagnosis are those that are clinically ascertainable. Where indicated, the clinical diagnosis is subject to confirmation by laboratory tests as described below. Consultation with a physician experienced in this diagnosis is advisable.

1. CESSATION IS RECOGNIZED WHEN EVALUATION DISCLOSES FINDINGS OF a AND b:

a. CEREBRAL FUNCTIONS ARE ABSENT, AND . . .

There must be deep coma, that is, cerebral unreceptivity and unresponsivity. Medical circumstances may require the use of confirmatory studies such as EEG or blood flow study.

b. BRAINSTEM FUNCTIONS ARE ABSENT.

Reliable testing of brainstem reflexes requires a perceptive and experienced physician using adequate stimuli. Pupillary light, corneal, oculocephalic, oculovestibular, oropharyngeal, and respiratory (apnea) reflexes should be tested. When these reflexes cannot be adequately assessed, confirmatory tests are recommended.

Adequate testing for apnea is very important. An accepted method is ventilation with pure oxygen or an oxygen and carbon dioxide mixture for ten minutes before withdrawal of the ventilator, followed by passive flow of oxygen. (This procedure allows PaCO₂ to rise without hazardous hypoxia.) Hypercarbia adequately stimulates respiratory effort within thirty seconds when PaCO₂ is greater than 60 mmHg. A ten minute period of apnea is usually sufficient to attain this level of hypercarbia. Testing of arterial blood gases can be used to confirm this level. Spontaneous breathing efforts indicate that part of the brainstem is functioning.

Peripheral nervous system activity and spinal cord reflexes may persist after death. True decerebrate or decorticate posturing or seizures are inconsistent with the diagnosis of death.

2. IRREVERSIBILITY IS RECOGNIZED WHEN EVALUATION DISCLOSES FINDINGS OF a AND b AND c:

a. THE CAUSE OF COMA IS ESTABLISHED AND IS SUFFICIENT TO ACCOUNT FOR THE LOSS OF BRAIN FUNCTIONS, AND . . .

Most difficulties with the determination of death on the basis of neurologic criteria have resulted from inadequate attention to this basic diagnostic prerequisite. In addition to a careful clinical examination and investigation of history, relevant knowledge of causation may be acquired by computed tomographic scan, measurement of core temperature, drug screening, EEG, angiography, or other procedures.

b. THE POSSIBILITY OF RECOVERY OF ANY BRAIN FUNCTIONS IS EXCLUDED, AND . . .

The most important reversible conditions are sedation, hypothermia, neuromuscular blockade,

and shock. In the unusual circumstance where a sufficient cause cannot be established, irreversibility can be reliably inferred only after extensive evaluation for drug intoxication, extended observation, and other testing. A determination that blood flow to the brain is absent can be used to demonstrate a sufficient and irreversible condition.

c. THE CESSATION OF ALL BRAIN FUNCTIONS PERSISTS FOR AN APPROPRIATE PERIOD OF OBSERVATION AND/OR TRIAL OF THERAPY.

Even when coma is known to have started at an earlier time, the absence of all brain functions must be established by an experienced physician at the initiation of the observation period. The duration of observation periods is a matter of clinical judgment, and some physicians recommend shorter or longer periods than those given here.

Except for patients with drug intoxication, hypothermia, young age, or shock, medical centers with substantial experience in diagnosing death neurologically report no cases of brain functions returning following a six hour cessation, documented by clinical examination and confirmatory EEG. In the absence of confirmatory tests, a period of observation of at least twelve hours is recommended when an irreversible condition is well established. For anoxic brain damage where the extent of damage is more difficult to ascertain, observation for twenty-four hours is generally desirable. In anoxic injury, the observation period may be reduced if a test shows cessation of cerebral blood flow or if an EEG shows electrocerebral silence in an adult patient without drug intoxication, hypothermia, or shock.

Confirmation of clinical findings by EEG is desirable when objective documentation is needed to substantiate the clinical findings. Electrocerebral silence verifies irreversible loss of cortical functions, except in patients with drug intoxication or hypothermia. (Important technical details are provided in: American Electroencephalographic Society, *Guidelines in EEG 1980*, Section 4: "Minimum Technical Standards for EEG Recording in Suspected Cerebral Death," pp. 19-24, Atlanta, 1980.) When joined with the clinical findings of absent brainstem functions, electrocerebral silence confirms the diagnosis.

Complete cessation of circulation to the normothermic adult brain for more than ten minutes is incompatible with survival of brain tissue.

Documentation of this circulatory failure is therefore evidence of death of the entire brain. Four-vessel intracranial angiography is definitive for diagnosing cessation of circulation to the entire brain (both cerebrum and posterior fossa) but entails substantial practical difficulties and risks. Tests are available that assess circulation only in the cerebral hemispheres, namely radioisotope bolus cerebral angiography and gamma camera imaging with radioisotope cerebral angiography. Without complicating conditions, absent cerebral blood flow as measured by these tests, in conjunction with the clinical determination of cessation of all brain functions for at least six hours, is diagnostic of death.

Complicating Conditions

A. Drug and Metabolic Intoxication

Drug intoxication is the most serious problem in the determination of death, especially when multiple drugs are used. Cessation of brain functions caused by the sedative and anesthetic drugs, such as barbiturates, benzodiazepines, meprobamate, methaqualone, and trichloroethylene, may be completely reversible even though they produce clinical cessation of brain functions and electrocerebral silence. In cases where there is any likelihood of sedative presence, toxicology screening for all likely drugs is required. If exogenous intoxication is found, death may not be declared until the intoxicant is metabolized or intracranial circulation is tested and found to have ceased.

Total paralysis may cause unresponsiveness, areflexia, and apnea that closely simulates death. Exposure to drugs such as neuromuscular blocking agents or aminoglycoside antibiotics, and diseases like myasthenia gravis are usually apparent by careful review of the history. Prolonged paralysis after use of succinylcholine chloride and related drugs requires evaluation for pseudocholinesterase deficiency. If there is any question, low-dose atropine stimulation, electromyogram, peripheral nerve stimulation, EEG, tests of intracranial circulation, or extended observation, as indicated, will make the diagnosis clear.

In drug-induced coma, EEG activity may return or persist while the patient remains unresponsive, and therefore the EEG may be an important evaluation along with extended observation. If the EEG shows electrocerebral silence, short latency auditory or somatosensory evoked potentials may be used to test brainstem functions, since these potential are unlikely to be affected by drugs.

Some severe illnesses (e.g., hepatic encephalopathy, hyperosmolar coma, and preterminal uremia) can cause

deep coma. Before irreversible cessation of brain functions can be determined, metabolic abnormalities should be considered and, if possible, corrected. Confirmatory tests of circulation or EEG may be necessary.

B. Hypothermia

Criteria for reliable recognition of death are not available in the presence of hypothermia (below 32.2 °C core temperature). The variables of cerebral circulation in hypothermic patients are not sufficiently well studied to know whether tests of absent or diminished circulation are confirmatory. Hypothermia can mimic brain death by ordinary clinical criteria and can protect against neurologic damage due to hypoxia. Further complications arise since hypothermia also usually precedes and follows death. If these complicating factors make it unclear whether an individual is alive, the only available measure to resolve the issue is to restore normothermia. Hypothermia is not a common cause of difficulty in the determination of death.

C. Children

The brains of infants and young children have increased resistance to damage and may recover substantial functions even after exhibiting unresponsiveness on neurological examination for longer periods than do adults. Physicians should be particularly cautious in applying neurologic criteria to determine death in children younger than five years.

D. Shock

Physicians should also be particularly cautious in applying neurologic criteria to determine death in patients in shock because the reduction in cerebral circulation can render clinical examination and laboratory tests unreliable.