How the Distinction between “Irreversible” and “Permanent” Illuminates Circulatory–Respiratory Death Determination

JAMES L. BERNAT*

Dartmouth-Hitchcock Medical Center, Lebanon, New Hampshire, USA

*Address correspondence to: James L. Bernat, MD, Neurology Department, Dartmouth-Hitchcock Medical Center, One Medical Center Drive, Lebanon, NH 03756, USA. E-mail: bernat@dartmouth.edu

The distinction between the “permanent” (will not reverse) and “irreversible” (cannot reverse) cessation of functions is critical to understand the meaning of a determination of death using circulatory–respiratory tests. Physicians determining death test only for the permanent cessation of circulation and respiration because they know that irreversible cessation follows rapidly and inevitably once circulation no longer will restore itself spontaneously and will not be restored medically. Although most statutes of death stipulate irreversible cessation of circulatory and respiratory functions, the accepted medical standard is their permanent cessation because permanence is a perfect surrogate indicator for irreversibility, and using it permits a more timely declaration. Therefore, patients properly declared dead in donation after circulatory death (DCD) protocols satisfy the requirements of death statutes and do not violate the dead donor rule. The acronym DCD should represent organ “donation after circulatory death” to clarify that the death standard is the permanent cessation of circulation, not heartbeat. Heart donation in DCD does not retroactively negate the donor’s death determination because circulation has ceased permanently.

Keywords: brain death, DDR, definition of death, donation after circulatory death, irreversibility

I. STATEMENT OF THE PROBLEM

The definition and determination of human death is one of the oldest and most enduring problems in bioethics and biophilosophy. Although the
enactment of more or less uniform death statutes throughout the United States and the growing uniformity of medical practices on the determination of death throughout the world both constitute evidence that the solution to this problem is achieving a consensus (Capron, 2001), scholarly debates continue over whether the prevailing formulation gets it right or is merely a convenient legal fiction.

Biophilosophical attention to the definition and determination of death has been stimulated primarily by developments in life-sustaining technologies and by the growth and acceptance of multiorgan transplantation. Positive-pressure ventilators supporting failed respiration permit the medical continuation of systemic circulation and visceral organ functions that stopped because the brain was destroyed, a situation that produces ambiguity about whether such a person is dead or alive. Historians have recounted how the need for organ donors for transplantation was a driving factor in the development of neurological tests to determine death, misleadingly called “brain death” (Giacomini, 1997, 1469–70). Medical practices and laws permitting physicians to diagnose death using neurological tests were grounded more in intuition than proof because they were in place a decade prior to the publication of the first rigorous biophilosophical accounts that such patients were actually dead.

Today, new developments in organ transplantation technology again are driving conceptual thinking about the determination of death. Programs of organ donation after circulatory death (DCD) permit physicians to declare death on prospective organ donors within minutes of cessation of breathing and circulation, at a time when it still remains possible to resuscitate the donor. This fact has led some critics to claim that, given the potential for reversibility, the donor was not dead at the moment death was declared (Menikoff, 1998). Moreover, medical standards for conducting respiratory–circulatory death determinations are vague, vary among institutions, and have not been formulated through a rigorous analysis. Guidance from death statutes is ambiguous because terms used in statutes, such as the “irreversible” cessation of function, are not defined and subject to interpretation. The recent expansion of the boundaries of DCD practices into new areas, such as procuring donor hearts, raises further questions of whether the donors are dead at the moment of organ recovery. According to some critics, the donor’s irreversible cessation of heartbeat, on which death determination purportedly was based, clearly was reversible (Veatch, 2008).

In this article, I offer an analysis to address the question of whether DCD donors are dead at the moment they are declared dead. I argue that the answer to this question turns on the distinction between the “permanent” and “irreversible” cessation of circulatory and respiratory functions. I show that, whereas, irreversibility is a requirement for the definition and criterion of death, and for the loss of clinical brain functions in a brain death determination, a circulatory–respiratory death determination requires demonstrating only that circulatory and respiratory functions have ceased permanently.
II. A BIOPHILOSOPHICAL ANALYSIS OF DEATH

Beginning a decade after the publication of the influential Harvard Medical School report that popularized the “brain death” concept and term, scholars began to rigorously address the question of whether and why brain dead patients are truly dead. My colleagues, Charles Culver and Bernard Gert, and I contributed to this effort by arguing that an analysis of death should be ordered sequentially, proceeding from the conceptual to the tangible and measurable (Bernat, Culver, and Gert, 1981, 390–3). The orderly sequence of analysis that we offered—paradigm, definition, criterion, and tests—has been accepted by most subsequent scholars studying this question, including by many of those who disagree with elements of our analysis.

The paradigm of death is the set of assumptions that frames the argument to clarify the nature of the phenomenon under analysis.¹ For example, the assumption that death is fundamentally a biological (not a social) phenomenon is an essential component of the paradigm. Most relevant to this discussion is the paradigm requirement that death is irreversible. Irreversibility is such an intrinsic characteristic of death that any alleged return from death to a living state necessarily implies that a process of incipient dying was reversed but the person was never dead. Descriptions of “near-death” phenomena are simply that: subjective accounts of experiences in which a process of incipient dying was reversed but the person was never dead.

All plausible definitions of death require irreversibility. For example, my preferred definition, “the irreversible cessation of the critical functions of the organism as a whole” requires that, when dead, it is impossible for the critical functions of the organism as a whole to be restored. Definitions of death proposed by others, including those embracing the higher brain, brain stem, or circulation formulation, also require irreversibility. Any case of a person who returned to life after satisfying a definition of death would constitute a counterexample that would render that definition untenable.

The criterion of death that my colleagues and I favored (that has been accepted in nearly all countries in which brain death determination is practiced)—the irreversible cessation of all the clinical functions of the brain—also makes irreversibility a prerequisite. Such a “whole-brain” criterion of death was chosen because it best satisfies the definition of death and because it permits a fail-safe measure to assure irreversibility and totality of brain destruction. When profound and diffuse brain damage is caused by brain illness or injury, the resultant brain edema induces a rise in intracranial pressure stopping all blood flow to the brain and thereby resulting in widespread irreversible ischemic damage to brain structures (particularly the brain stem) that initially may have been spared by the primary illness or injury. This secondary brain damage usually results in the irreversible cessation of all clinical brain functions and permits a test confirming this fact by showing the absence of all intracranial circulation (Bernat, 1992, 22–4).²
The whole-brain criterion of death was endorsed by the President’s Council on Bioethics in their recent report *Controversies in the Determination of Death*. The Council supported a definition of death based on the loss of functioning of the organism as a whole. But in response to critics who pointed out weaknesses in justifying this definition by citing the loss of the organism’s integrative capacities (*Shewmon, 2001*), they argued, instead, that the definition should be grounded on the “the inability of the organism to conduct its self-preserving work” (*President’s Council on Bioethics 2008, 60–5*). This justification also has weaknesses, as enumerated by *Shewmon (2009)*.

However one justifies it, a brain-centered formulation of death underlies current international medical and legal death determination standards, and provides that a person is dead when all clinical brain functions have ceased irreversibly (*Wijdicks, 2002*). Physicians declaring death may use two sets of tests of death to show that the whole-brain criterion of death has been fulfilled. If the patient is receiving positive-pressure ventilation, physicians must use the neurological tests to show the irreversible cessation of all clinical brain functions (brain death). The traditional and more commonly used test to determine death in patients not on ventilators or who will not receive resuscitation is to show the cessation of circulation and respiration. This test is accurate only because it leads to the destruction of the brain as a result of stopping brain circulation. If a medical intervention, such as cardiopulmonary resuscitation (CPR) or extracorporeal membrane oxygenation (ECMO), mechanically reestablishes circulation and respiration before the brain has been destroyed, however, the person is not dead. Cessation of circulation and respiration, therefore, serves as a valid surrogate indicator for cessation of all clinical brain functions in the absence of therapeutic interventions that reestablish circulation and oxygenation.

To fulfill the criterion of death, accepted medical tests for brain death all require the irreversible cessation of measured brain functions. Usually, irreversibility cannot be proved clinically but is assumed to be present when (1) an anatomic lesion is demonstrated that alone is sufficient to produce the neurological signs, (2) the absence of all clinical brain functions is demonstrated in sequential tests performed over a time interval, and (3) potentially reversible contributing factors have been excluded. I have argued that because of potential errors in assessment, particularly by inexperienced physicians, more definitive proof of irreversibility is desirable and generally should be required. This proof is easily accomplished by demonstrating the cessation of all brain circulation by intracranial blood flow testing (*Bernat, 2004, 166–7*). Yet, despite the fact that brain functions must be shown to have irreversibly ceased, the more commonly applied medical tests for death that show cessation of circulation and respiration require showing only that they have ceased permanently.
III. THE DISTINCTION BETWEEN PERMANENT AND IRREVERSIBLE

What is the distinction between an irreversible and a permanent cessation of functions and why is it important? The terms “irreversible” and “permanent” at first sound synonymous but have an important difference when applied to loss of functions in tests of death. The Oxford English Dictionary (OED), second edition, defines irreversible as something “that cannot be undone, repealed, or annulled; irrevocable.” Thus, a loss of a function can be said to be irreversible if that function cannot possibly be regained spontaneously or restored through intervention using any available technology. “Irreversible” is an absolute and univocal statement that reflects the physical reality of immutability, that implies technical (although not theoretical) impossibility, and is a condition that exists independently of our intent or action (Bernat, 2006, 124).

By contrast, the OED defines permanent as “continuing or designed to continue indefinitely without change; abiding, lasting, enduring, persistent (opposed to ‘temporary’).” Thus, a loss of function can be said to be permanent if that function will neither restart spontaneously nor be restored as a result of medical intervention because physicians will not attempt resuscitation or use other means to restore it. “Permanent” therefore is an equivocal and contingent condition that admits possibility. It may rely on our intent and action to be realized and does not refer directly to the possibility of reversal.

Permanent and irreversible cessation of functions are distinct phenomena but are related causally. All functions that are irreversibly lost are also permanently lost (but not vice versa). In death determinations in which resuscitation measures to support ventilation and circulation are not performed, circulatory and respiratory functions that are permanently lost become irreversibly lost rapidly and inevitably. Therefore, the permanent cessation of function is a valid surrogate for the irreversible cessation whose use allows physicians to make a more timely determination of death (Bernat, 2006, 125).

That permanent cessation of circulatory and respiratory functions is the currently practiced medical standard for determining death can be illustrated by considering a typical case. A terminally ill man with widely metastatic lung cancer was admitted to the hospital for palliative care. He was designated “Do Not Resuscitate,” treated with morphine and expected to die within a few days. On 5:00 a.m. rounds, nurses noted he was unconscious and breathing irregularly. At 6:00 a.m. rounds, he had no pulse or breathing. A physician was called and declared him dead. The physician made no attempt to determine that his cessation of circulation and breathing was irreversible, only that it was permanent. The physician knew that heartbeat and breathing do not spontaneously restart in such cases and that no medical intervention would be used to restart them. Therefore, it was unnecessary to prove that the patient’s circulation and respiration had ceased irreversibly. Permanent
cessation was sufficient because it quickly and inevitably progresses to irreversible cessation and no benefit was gained by waiting longer.

Although diagnosing death by neurological testing by directly assessing clinical brain functions requires showing their irreversible cessation, diagnosing death on the basis of absent circulation and respiration requires showing only their permanent cessation. In the absence of medical intervention, an irreversible cessation occurs rapidly and inevitably following permanent cessation; thus, there is no difference in outcomes when physicians use a permanent standard rather than an irreversible standard. In this setting, permanence is a perfect surrogate indicator for irreversibility.

The asymmetry between the requirement for demonstrating irreversibility of clinical brain functions but permanence of cessation of circulatory and respiratory function may seem odd but is simply a consequence of the timing of each determination. A brain death determination is conducted in retrospect to prove that the irreversible cessation of all clinical brain functions already has occurred. Although it is accurate to state that death had occurred earlier, that fact cannot be proved until direct neurological testing is performed (Lynn and Cranford, 1999). By contrast, most circulatory–respiratory death determinations are conducted prospectively because the finding that circulation and respiration have ceased permanently constitutes sufficient proof that all brain functions will cease irreversibly in the immediate future.

IV. STATUTES OF DEATH

The language used in many death statutes has created ambiguity because the drafters of the statutes made no distinction between permanent and irreversible cessation of functions. In 1981, the US President’s Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research published Defining Death, a highly influential report that consolidated the validity of using neurological tests to determine death and proposed a uniform death statute, the Uniform Determination of Death Act (UDDA). Subsequently, nearly all states adopted the UDDA or a similarly worded statute of death (Beresford, 1999, 295).

The UDDA provides

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.

At the time the UDDA was proposed, my colleagues and I criticized it for erroneously elevating the two alternative tests of death to the level of criteria of death without explaining the relationship between them (Bernat, Culver,
and Gert, 1982). Because the UDDA used the word “irreversible,” most subsequent commentators understandably assumed that the drafters of the UDDA intended the strict definition of the word (impossibility). However, the President’s Commission used irreversible and permanent interchangeably in their discussion in *Defining Death*. Moreover, the Commission’s medical consultants (who advised physicians on the optimal bedside techniques to determine death) used the standard of permanent cessation of circulatory and respiratory functions by recommending that physicians observe for the “prolonged” absence of these functions. The Executive Director of the President’s Commission, Alexander Capron, later explained that despite the use of irreversible in the UDDA, the medical consultants’ guidance to physicians to use a permanence standard was consistent because physicians’ customary practices were encompassed within the UDDA language of “in accordance with accepted medical standards.”

The Law Reform Commission of Canada published a model death statute in 1979 that avoided the deficiencies of the UDDA by (1) clarifying that irreversible cessation of brain functions was the sole criterion of death, (2) showing that physicians could use bedside tests to prove the unitary criterion in two alternative ways, (3) explaining that the cessation of circulatory and respiratory functions served as valid a test of death only because it led to the cessation of brain functions, and (4) stipulating that the cessation of circulatory and respiratory functions need not be irreversible, only prolonged. The Canadian statute provided:

A person is dead when an irreversible cessation of all that person’s brain functions has occurred.

The cessation of brain functions can be determined by the prolonged absence of spontaneous cardiac and respiratory functions.

When the determination of the absence of spontaneous cardiac and respiratory functions is made impossible by the use of artificial means of support, the cessation of brain functions may be determined by any means recognized by the ordinary standards of current medical practice (Law Reform Commission of Canada, 1979, 58–9).

The Canadian statute, unlike the UDDA, makes explicit that only a permanent cessation of circulatory and respiratory functions is required. Yet, if Capron is correct that the irreversible cessation stipulated in the UDDA is fulfilled when physicians determine their permanent cessation, it is consistent with the usage in the Canadian statute and with prevailing medical practices.

V. DEATH DETERMINATION USING CIRCULATORY–RESPIRATORY TESTS IN DCD

The standard of permanent cessation of circulation and respiration constitutes a valid surrogate test for the standard of irreversible cessation when
two conditions are satisfied: (1) spontaneous resumption of the ceased functions cannot occur and (2) medical interventions will not be attempted to restart the ceased functions. When physicians determine death in patients who are expected to die, are not organ donors, are not receiving life-sustaining therapy, and are not CPR candidates, they determine only the permanent cessation of circulation and respiration. It is inconsequential whether the death declaration is made before the cessation of functions becomes irreversible. But in the DCD organ donor, it becomes consequential to make the determination as early as it can possibly be accomplished accurately to preserve donated organ function. The practice of DCD has simply highlighted the need for greater precision in physicians’ practices of determining death and the absence of uniform guidelines.

In “controlled” DCD, such as that which is practiced in the United States, the surrogate decision maker for a severely brain-injured but not “brain-dead” patient on a ventilator refuses further life-sustaining therapy and gives consent for organ donation after the patient is declared dead. Once the ventilator has been withdrawn, the patient’s heartbeat usually stops within an hour. Each hospital creates its own protocol that stipulates how death will be determined. In most hospitals, the intensive care unit team declares the patient dead once lack of circulation has been observed for 5 min, after which the patient is rushed to the operating room for organ recovery. DeVita (2001) has called this waiting interval the “death watch.” Some hospitals wait only 2 min; others longer than 5 min. In one recent controversial report, the physicians shortened the death watch to only 75 s after the hospital ethics committee had approved the change (Boucek et al., 2008). Some DCD protocols also require physicians to measure arterial blood flow to prove that all circulation is absent.

The variability of circulatory–respiratory death practices among DCD protocols has highlighted the need for uniform guidelines. These guidelines should be based on accepted principles, empirical data, and prudential considerations (Bernat, 2008). The empirical question is how long physicians need to observe patients whose hearts have stopped beating to guarantee that the heart will not restart on its own (autoresuscitate). A database of modest size that has been accumulated to address this question shows that autoresuscitation has not been observed once 65 s of absent heartbeat (asystole) has elapsed (DeVita et al., 2000). However, the database consists of fewer than 200 patients, so the confidence interval is small. When formulating uniform guidelines, it is prudent to extend this interval assuming that autoresuscitation after 65 s of asystole may be observed in future cases. The Institute of Medicine (2000), therefore, recommended waiting for 5 min, an interval that has been incorporated into the protocols of most American DCD programs. The Ethics Committee of the American College of Critical Care Medicine and Society of Critical Care Medicine (2001) suggested waiting a minimum of 2 min and a maximum of 5 min. The attendees at the National
Conference on DCD in 2005 endorsed the Society of Critical Care Medicine recommendation (Bernat et al., 2006).

Patients declared dead in DCD protocols after 2–5 min of absent circulation can be considered dead because they have permanently lost circulation and respiration. Because they will neither autoresuscitate nor be subjected to CPR, their permanent cessation of circulation and respiration is a perfect surrogate indicator for the irreversible cessation of these functions.

Some critics have argued that the consequentiality of death determination in DCD distinguishes it in an essential way from analogous death determinations in nondonation circumstances, and therefore they have doubted the validity of permanence as a surrogate indicator (Menikoff, 1998). But the consequentiality of the DCD circumstance does not change the validity of using permanence as a surrogate indicator; it only enhances the requirement that physicians prove conclusively that circulation and respiration have ceased fully and permanently. Analogous to my argument that prudent physicians should prove the irreversibility of the loss of clinical brain functions in a brain death determination by showing absent brain blood flow, I believe they should routinely measure arterial blood flow in DCD death determinations to assure its utter absence and observe the patient for a sufficient interval to exclude the possibility of autoresuscitation.

The recent report of recovering hearts from three infants in a DCD protocol (Boucek et al., 2008) stirred controversy over whether restarting the stopped hearts in other infants retroactively negated the donor’s death determination by showing that the cessation of cardiac function was not irreversible. Prominent scholars in medical ethics (Veatch, 2008) and medical jurisprudence (Annas, 2009), who were asked to comment, claimed that this act violated the UDDA because, by reversing heart stoppage, it retroactively invalidated the donor’s death determination. They opined that therefore it should not be permitted.

But did recovering and restarting hearts after DCD death declaration invalidate the death declaration? The UDDA requires “the irreversible cessation of circulatory and respiratory functions.” Because permanent cessation is a perfect surrogate indicator for irreversible cessation, once circulation ceases permanently in the DCD donor, the donor is dead. Whether, thereafter, the donor heart is left in place, removed and left alone, or removed and restarted in another patient is irrelevant to the prior death declaration in the donor because the donor’s circulation has ceased permanently. Therefore, restarting the heart in another patient has no impact on the donor’s prior death determination, does not retroactively negate it, and is an insufficient reason for restricting the recovery of hearts in DCD.

One source of confusion on this issue is the commonly used but misleading phrase, “donation after cardiac death.” This phrase incorrectly implies that stoppage of heartbeat alone is the essential standard for death declaration. The correct standard, however, is cessation of circulation. Although
heartbeat ordinarily is responsible for circulation, it is only the absence of circulation that matters for death. Circulation technologies can maintain circulation despite the absence of a beating heart. When used successfully, these technologies conduct blood flow to the brain that permits continued normal brain functioning (despite absent heartbeat or even absence of the heart) in such a way that no one could claim that the patient is dead. The acronym DCD should refer to “donation after circulatory death” to prevent misinterpretation of the circulation standard as a cardiac standard.

VI. SOCIETAL CONSIDERATIONS

In the United States, the Uniform Anatomical Gift Act has been enacted in all states. One of its provisions, the requirement that the multiorgan transplant donor must first be dead so that organ donation does not cause the donor’s death, is popularly known as the dead donor rule (DDR). Organ donation after a properly performed brain death determination clearly fulfills the DDR, but some scholars have questioned whether death determination in DCD violates the DDR because of the potential reversibility of circulatory functions at the time of death declaration. Many commentators argue that respecting the DDR is an important ethical axiom in organ transplantation (Robertson, 1999), but some critics claim that the DDR is violated routinely in DCD and is entirely unnecessary if the consent of a dying patient is obtained (Miller and Truog, 2008).

The argument that death determination in DCD respects the DDR has three elements: (1) the donor is dead at the moment of organ donation, (2) surgical removal of the organs does not cause the donor’s death, and (3) surgical removal of the organs does not prospectively or retroactively interfere with the death determination. The first element follows from the preceding analysis of the distinction between the permanent and irreversible cessation of circulatory and respiratory functions. Once a permanent cessation has been established, the DCD donor is dead for exactly the same reason as patients declared dead who are not organ donors: permanence is a perfect surrogate indicator for irreversibility in this setting and is the unquestioned medical standard for death determination. It thereby fulfills the irreversibility standard as interpreted by the accepted medical practice clause in the death statute.

The argument in the second and third elements is analogous to those used to justify heart recovery in DCD. Once the donor’s circulation has stopped permanently, the brain undergoes a rapid and inevitable process of hypoxic–ischemic infarction until it is completely destroyed, at which point irreversibility of circulatory, respiratory, and brain functions is established and the criterion of death is satisfied. Once physicians document a permanent cessation of circulation, removal of the patient’s organs for transplantation neither
accelerates nor impedes this inevitable process of hypoxic–ischemic brain destruction because it exerts no effect whatsoever on it (Menikoff, 1998). Therefore, organ recovery does not cause death or interfere with its determination.

Society permits physicians to declare death as soon as they can determine it with complete accuracy. Because of technical limitations, documented errors, and public fears of incorrect death declaration and premature burial, some 18th- and 19th-century physicians advocated awaiting rigor mortis, putrefaction, or other unequivocal signs of death before making the declaration (Powner et al., 1996). Today, physician errors in performing circulatory–respiratory or neurological death determinations are rare but are documented occasionally when physicians fail to follow accepted practice standards. Given the consequentiality of death declaration in DCD, careful physicians prove that the cessation of circulation is permanent by observing a death watch for at least 2 min (and preferably 5 min) and prove the cessation of circulation is total by showing the absence of arterial blood flow on direct measurement.

Eliminating the DDR, as advocated by Truog and colleagues, is unnecessary for either DCD or donation after brain death and its abandonment likely would create problems. Its continued respect reassures a skeptical and fearful public that surgeons will not remove their organs until after they are dead, a concern expressed repeatedly in recent focus group analyses (Mandell et al., 2006; D’Alessandro et al., 2008). It thereby enhances public confidence in the medical profession and in the organ transplantation enterprise. The DDR should be maintained in the same spirit of prudence that motivates maintaining other accepted ethical principles of organ transplantation, such as the rule requiring the strict separation of those physicians declaring the death of the donor from those serving on the transplantation team (Bernat, 2008).

VII. FUTURE DIRECTIONS

Developing uniform national practice guidelines for circulatory–respiratory death determinations in DCD is desirable for the same reason that they have been advocated for brain death determinations (Choi et al., 2008). Guidelines should be based on a rigorous analysis of death accompanied by prudential societal considerations. Once established, these practice guidelines then can be used to assess the compliance of innovative DCD protocols with the accepted standards for determining death. The US Department of Health and Human Services Health Resources and Services Administration Department of Transplantation—the agency that provides funding for most DCD experimental protocols—recently has convened an expert panel to draft model guidelines. Initially, they plan to apply their guidelines to two emerging and controversial
DCD protocols: ECMO of the deceased organ donor and heart recovery. Later, they plan to apply their analysis to “uncontrolled” DCD protocols.7

Advances in technology continue to provoke biophilosophical discourse on the definition and determination of death but not because technology has changed the definitions of life and death. Rather, technology has generated cases that previously were impossible—cases that have made us aware of definitional ambiguities of which we had been previously unaware and have forced us to make distinctions and clarifications. Once the positive-pressure ventilator permitted cases of brain death, we realized that previously we lacked a clear definition of death because, when such cases were not possible, it had been unnecessary for us to formulate one. Similarly, physicians’ traditionally casual practices in determining “circulatory death” were not an issue prior to DCD. Now, physicians need to distinguish a permanent from an irreversible cessation of respiratory and circulatory functions and to validate tests that prove permanence and complete cessation. Understanding the distinction between the permanent and irreversible cessation of functions helps resolve important conceptual and practical problems in death determination that have been introduced by DCD.

NOTES

1. I have described and defended each element of the paradigm in Bernat (2002).
2. It is beyond the scope of this article to provide a more complete justification of the whole-brain criterion of death. See Bernat (1992, 2002).
3. Others have made a similar distinction by offering multiple interpretations of “irreversibility.” For example, see Cole (1992, 1993), McMahan (1995), Robertson (1999), Youngner et al. (1999), and Lizza (2005). I have discussed and critiqued these approaches in Bernat (2006).
5. For a discussion of the conceptual basis of DCD, see Institute of Medicine (1997). For sample DCD protocols, see Institute of Medicine (2000). For prevailing practices and trends of DCD in the United States, see Bernat et al. (2006).
6. In addition to advocating the abandonment of the DDR, Truog and colleagues argue that brain death is an unnecessary and illogical anachronism that should be abandoned. See Truog (1997) and Truog and Robinson (2003).
7. The first report of this panel was published recently (Bernat et al., 2010).

REFERENCES


