

The New England Journal of Medicine

Correspondence

The Diagnosis of Brain Death

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Citing Articles (5)

To the Editor:

At the beginning of his article on brain death (April 19 issue),¹ Dr. Wijdicks states, “Physicians, health care workers, members of the clergy, and laypeople throughout the world have accepted fully that a person is dead when his or her brain is dead.” This statement is dogma, not fact. Many societies throughout the world and some cultures represented in American society do not accept this view. As he later implies, the introduction of brain death as a construct was a political decision first promoted in 1968 by an ad hoc committee at Harvard Medical School, prompted by a growing need for organs for transplantation.

Dr. Wijdicks also states, “After the clinical criteria of brain death have been met, the physician should inform the next of kin, who can be approached about organ donation.” He adds, “If the legal next of kin declines to donate organs, it is good medical judgment to discontinue mechanical ventilation.” Although decision making at the end of life should involve family members, the physician must first ascertain whether advance directives such as a living will or power of attorney for health care have been completed. If someone other than a family member has been named, then this agent is responsible for making such decisions.

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[1 Reference](#)

To the Editor:

In describing the apnea test, Dr. Wijdicks states, “The mechanical ventilator must be disconnected . . . because the ventilator's sensors may give false readings.” Whether the patient breathes during the apnea test should be assessed by looking at the patient, not the ventilator. Apneic oxygenation can be performed in many ways, including by continuous flow of oxygen through a ventilator with a rate set at zero.^{1,2} This is how the initial studies of apneic oxygenation were performed.³ Patients with lung injury may be better oxygenated if they are provided with continuous positive airway pressure, which is most easily and safely delivered through a ventilator. The oxygenation technique Wijdicks advocates, with an oxygen catheter “at the carina (delivering oxygen at a rate of 6 liters per minute),” could result in a pneumothorax, especially in a small child.⁴

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[4 References](#)

To the Editor:

There is no substantial evidence in support of Dr. Wijdick's claim that one criterion for the diagnosis of brain death is a pupil diameter between 4 and 6 mm. According to one report, the mean pupil diameter in seven brain-dead subjects was 6.7 mm.¹

We recently measured the pupil diameter in seven other brain-dead subjects, using calibrated infrared pupillometry (which is accurate to 0.1 mm); the mean (\pm SD) diameter was 5.5 ± 1.0 mm. In one subject the pupil diameter was 3.9 mm, and in another it was 7.4 mm. Small (miotic)² as well as large³ pupils in brain-dead subjects have also been observed by other investigators. The important pupillary sign in the diagnosis of brain death is the absence of the light reflex. The pupil is usually close to midposition, but its size is not relevant to the diagnosis of brain death.

We also disagree with the statement that the pupillary response to light remains intact under the influence of anesthetic agents. This may be true at low concentrations that permit other midbrain reflexes. However, higher concentrations prevent movement and coughing in response to noxious stimuli, effects that might raise the question of brain death. At high concentrations, anesthetic agents can even abolish all midbrain reflexes, including the pupillary light reflex.⁴

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[4 References](#)

To the Editor:

Wijdicks fails to recognize the deep problems that exist with the concept of brain death. These problems begin with the title of his article, “The Diagnosis of Brain Death.” It is difficult — indeed, impossible — to have diagnostic standards for a condition that has never been adequately defined. For example, although most states define brain death as the absence of all brain function,¹ no competent neurologist would argue that all cases in which brain death is diagnosed conform to this definition.² The typical reply to this criticism is to claim that surviving neurologic functions, such as the secretion of antidiuretic hormone from the pituitary, are not “significant.”² But if it is a question of significance, why do we place great emphasis on the pupillary light and corneal reflexes (neurologic functions of minimal physiologic significance) and ignore the neurologic regulation of salt and water homeostasis (neurologic functions of critical physiologic significance)? Elsewhere, one of us has described many other problems with the concept.³

Although everyone would agree that society derives great benefit from a system that allows patients with devastating and unremediable brain injury to make gifts of their organs, we should not trivialize the complexities of justifying this practice on ethical and legal grounds. Capron concludes his accompanying editorial by admonishing physicians to “strive to be clear about the conceptual foundations of the definition [of brain death] they are implementing.”¹ Those who choose to follow this advice should be prepared to find that these conceptual foundations are not as sturdy as the superficial reassurances in these articles would suggest.

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[3 References](#)

To the Editor:

Capron confuses science and medicine with law and religion when he seeks to defend brain death as the legal measure of death in America. He adopts the view that brain death is a medical measure of death, thus “providing criteria for diagnosing a condition” of death. On the basis of this approach, he criticizes laws that allow “reasonable accommodation” of alternative standards for death, such as the statute in New Jersey.¹

A determination of death is a legal determination that a collection of living cells is no longer entitled to the rights granted to human beings, rather than a scientific or medical determination that all biologic life has ended.

Reasonable people agree that human tissue loses its status as a person before there is complete cellular lysis, but cannot agree on whether “humanness” legally disappears when brain function ceases, cardiopulmonary function ceases, or some other criterion is met. The question is, at its core, not a medical question but a moral or religious one.

To a religious person, death is the departure of the soul from the body. To a secular person, death is the point at which human rights no longer apply. Medicine cannot provide answers to either of these questions.

Accommodation of personal beliefs in ethical and religious matters, when such an accommodation can be made at little cost, is the hallmark of a proper society. New Jersey's law on determining death is the ideal one.

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[1 Reference](#)

Author/Editor Response

Dr. Wijdicks replies:

To the Editor: In answer to Cranston: the Uniform Determination of Death Act has been accepted by 31 states and the District of Columbia, and 13 states have used it to codify their statutes on brain death.¹ Furthermore, a study of criteria in 78 countries showed that there is judicial recognition of brain death in more than two thirds of the countries, with actual statutes in 86 percent (unpublished data).

This does not mean the world is devoid of vocal critics who support a different criterion. In his eloquent review,² Truog expresses the view that brain death is out of date and should be uncoupled from its unique link to transplantation. He advances the argument that a patient in a vegetative state may be withdrawn from life support for the purposes of transplantation. I do not believe that physicians and the public are prepared for such a drastic step.

It is unclear why Truog and Robinson believe that physiologic regulation of salt and water balance is ignored. The pituitary gland is supplied through extracerebral circulation, and salt and water homeostasis may be preserved initially in patients who do not have an acute mass severing the stalk. But in many others, progressive deterioration occurs because of profound polyuria and pulmonary edema, recurrent cardiac arrhythmias, intravascular coagulation, the need for increasing doses of dopamine, and possibly thyroid failure.³ This collapse distinguishes brain death from other comatose states. Although it is unusual, the spinal cord may reestablish a brittle homeostasis, but one should doubt a clinical diagnosis of brain death in a patient whose condition remains stable.⁴ Brain death may not necessarily indicate that every single hemispheric neuron has died, but it does indicate that the important ones in the brain stem have.

In response to Rockoff and Thompson: there have been no comparative studies of the performance of the apnea test. Disconnecting the ventilator with the use of adequate precautions and direct observation of possible breathing cycles is simple and safe. With a high flow of oxygen (more than 10 to 15 liters per minute), placement of the catheter at the carina has been linked to pneumothorax in only a few cases, and the causality is doubtful.⁵ I am unaware of a study suggesting an increased risk of pneumothorax in children. Pneumothorax is more often due to prior cardiopulmonary resuscitation and traumatic lung injury. My concern is that inadequate delivery of oxygen may damage organs suitable for recovery.

The additional data that Larson and Gray provide on the diameter of the pupil confirm the empirical fact that the pupil is typically in midposition. Nevertheless, the main issue here is that in patients with persistent maximal dilatation of the pupils or pinpoint pupils, whether or not they are light-fixed, poison or drug intoxication should be considered.

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[5 References](#)

Author/Editor Response

The editorialist replies:

To the Editor: Broyde seems both to misunderstand my editorial and to be applying ill-defined criteria in prescribing what would make a good law. To begin with, he confuses the “reasonable accommodation” requirement of the New York regulation¹ (which in practice means making minor adjustments in the timing and circumstances of declarations of death in the light of some families' religious customs) with the provisions of the New Jersey statute that effectively require physicians to use “traditional cardio-respiratory criteria” rather than “modern neurological criteria” when they have reason to believe that using the latter would violate the person's religious beliefs.² Does Broyde think these are equally appropriate “accommodations to personal beliefs”? Would a statute that said death should be declared when the soul departs (which he tells us is the definition used by “a religious person”) be equally appropriate?

In my editorial, I cited these statutes not so much to criticize them as to show that lack of clarity about the relation of “brain death” (a term I did criticize) to cardiopulmonary standards can lead to the impression that determining death is a matter of individual preference. Does Broyde seriously believe that “anything goes” is a defensible basis for public policy?

When deciding that a human body “is no longer entitled to the rights granted to human beings” — which Broyde at another point offers as a basis for a legal standard, though the Constitution actually protects “persons” — society looks to medicine for criteria and tests that can be applied reliably in determining that specified standards are met. The standards are selected with scientific guidance on the basis of their relation to essential characteristics; they represent a social choice about which characteristics to count, but (at least in the case of defensible legal standards) they are not arbitrary.

Truog and Robinson suggest — and Truog has repeatedly argued — that other criteria, which are not present in the prevailing protocols, ought to be considered. As I argued in my editorial, other experts on the subject remain unconvinced. Should the importance of such additional tests (or the irrelevance of existing ones) be established as accepted medical practice, the Uniform Determination of Death Act not only does not prevent but also affirmatively allows their use. Truog and Robinson's argument is not with me but with their colleagues in neurology and related fields.

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