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Brain-Based Determination of Death Revisited

by

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As I understand it, Dr. Alan Shewmon's defection from his previously held position of endorsing whole-brain death formulations is contingent on his abandonment of the axiom that the brain is the central integrating organ of the body.¹ While his arguments are cogent and impressively well documented, they are not necessarily persuasive nor do they seriously undermine the tenability of a position maintaining that the brain does perform a central integrating function. This latter position, as Dr. Shewmon points out, is currently held by the overwhelming majority of physicians including neurologists² as well as an impressive array of theologians^{3,4,5} including the advisers to the Pontifical Academy of Sciences.

The rationale for the acceptance of brain-based determination of death has been developed elsewhere in a Linacre Institute Paper.⁶ The authoritative document on the conceptual aspects of the central integrator doctrine was published in 1981 by the President's Commission for the Study of Ethical Problems in Medicine.⁷ The clinical diagnostic criteria developed by the medical consultants to the Commission have become the "gold standard" for legislation in most states abiding by the Uniform Anatomical Gift Act and the Uniform Determination of Death Act.⁸ The term "brain death" has, with the continuing development of neurophysiologic and neuropathologic understanding, become synonymous with total brain

infarction which is tantamount to destruction of the body's primary central integrating organ and the loss of somatic integrative unity. Objective evidence consists in neuroimaging or blood-flow evidence that total brain infarction has occurred.

Arguments against the Central Integrator theory include the Hassler experiments. These involve the restoration of consciousness to comatose patients by artificially stimulating the reticular activating system through an electrode stereotypically placed in intact basal gangliar structures.⁹ Shewmon refers to these studies as raising the possibility of having a "conscious corpse" through the stimulation of the thalamic cortical system in a "brain dead" patient. As I interpret the Hassler experiments, however, the experimental subjects do not have the "irreversible cessation of function of the entire brain including the function of the brain stem" which would be required for the definition of death. Hassler's experimental subjects have intact cortical and thalamo-cortical systems. If these systems had been structurally inactivated as they would be in total brain infarction, consciousness would not be capable of restoration. In fact, Hassler refers specifically to the studies of McLardy¹⁰ in which consciousness could not be restored because the midbrain reticular formation had been destroyed. The success of the Hassler experiments required an intact pallium and intact midbrain reticular formation. Such structural integrity is inconsistent with total brain infarction and therefore the possibility of a "conscious corpse" is fanciful and these experiments do not really seriously undermine "brain death" criteria.

In a similar way, it is difficult to understand why the so-called "experiments of nature" (upper cervical cord transection or bulbar paralysis due to Guillain-Barre disease) truly undermine the validity of the concept of whole brain death. Both diagnoses would involve discernable electroencephalographic activity. The patient with an upper cervical transection still has a functioning brain stem presumably and the bulbar complication of Guillain-Barre disease almost invariably follows a preexistant polyneuritis with an ascending Landry-type of paralysis. From a clinical standpoint, it is extremely far-fetched to presume that either of these entities could be confused with whole brain infarction. Imaging and blood flow studies would likely show an intact central nervous system circulation. The fact that the intensive care unit can substitute for the

brain stem by an elaborate scheme of technological assistance for respiration, blood pressure regulation fluid and electrolyte balance, parenteral nutrition and pituitary hormone replacement would reinforce as much as undermine the need for the central integration of the brain. There is no question that some individuals who fulfill the criteria for "complete and irreversible cessation of total brain function including the function of the brain stem" can be kept alive for finite periods of time with elaborate investments of high technology life support. There are even times when such support makes eminent good sense such as in the situation where a "brain dead" woman is gestating a pre-viable fetus.¹¹ The use of brain-based criteria for the determination of death, in the overwhelming majority of cases is to facilitate the decision-making process in which continuation of life support is contraindicated by the realities of the patient's hopeless prognosis. The various critiques of the validity of brain-based criteria for the determination of death make very little practical sense except in the context of a need to disqualify certain donors of unpaired organs for transplantation.¹² Likewise, the insistence on certain elaborate and comprehensive criteria for the declaration of death have very little application to the real world of clinical medicine. Byrne¹³ for example insists that death must not be declared until there is total destruction of the circulatory and respiratory systems and destruction of the entire brain. He even suggests that lack of spontaneous breathing not be considered tantamount to destruction of the respiratory system until there is evidence for the disintegration of the biological capacity for exchange of oxygen and carbon dioxide. The evidence to establish such a state would be so complex and elaborate that it is questionable that such a determination could be made as a practical clinical reality. What is obvious is that virtually all patients declared dead at home or in institutional settings have not yet reached the point of total destruction of all systems. There is some doubt as to whether there truly is an entity where the gas exchange function of the pulmonary tissues manifests itself in a patient on ventilatory support. Be that as it may, patients are being declared dead routinely when they stop breathing, when their heart stops beating, or when life support is discontinued and vital signs cease. This is universally accepted as proper procedure in a patient whose care is controlled by Do Not Resuscitate orders, but it would also be the case when

resuscitation has been attempted without success. The expected procedure in such cases would be to notify the next of kin that their loved one is "dead" (not dying) and to transport the patient to the morgue. Those who interpret death as an event rather than a process would have to concede that death as a theoretical end point of a process would not have occurred in most instances where "death" is declared. Those who hold the view that death is a process would accept that the death of the organism as a whole would precede the death of the whole organism. That is, that not all tissues simultaneously cease to function and death as a process would be consistent with persistent evidence of some focal or localized cell activity. This cellular activity might continue until some thermodynamic endpoint is reached which is incompatible with any vital process. The rate of progression to this endpoint would vary from patient to patient depending on the functional reserve of certain vital organs, the preexistence of debilitating illness, the use of certain drugs in treatment and other unknown and unknowable factors. Shewmon¹ estimates that 20-30 minutes without circulation would be required but this is an estimate or an educated "guess" by his own description.

What is being attempted by all conscientious attending physicians is to know the unknowable, that is the point at which the soul leaves the body. The overarching desire is to avoid declaring death before it has irreversibly occurred. However, the unwillingness to acknowledge death when that state realistically occurred may very well be the predominant fear in the mind of terminally ill patients and the public at large.¹⁴ The degree of certitude required in any instance would be influenced by the anticipated removal of an unpaired organ for transplantation. This is obviously related to the fact that the donor, if not already dead, will be killed by the transplant procedure. The dead donor rule requires that the donor be dead according to existing medical standards which currently would be "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 — is dead." (It is noted that this definition is not reliably accurate in the newborn period.)¹⁵

Whereas the original "Harvard Criteria" may have been tainted by wish fulfillment for transplant surgeons,¹⁶ it is

inappropriately pejorative to continue to allege that the current refined and nuanced definition of brain-based criteria for the determination of death are merely an "invention" to allow live patients to qualify as donors. The vast majority of patients declared dead in a clinical setting will have died as a result of cessation of respiration and/or heartbeat. The vast majority of patients declared dead on the basis of "irreversible cessation of total brain function, including the function of the brain stem" will not even be candidates for organ donation but rather patients in whom discontinuation of artificial life support is contemplated.

The rationale for declaring patients dead on the basis of brain-based criteria will not be persuasive for all physicians caring for terminally ill patients. The majority of individual physicians who accept such criteria are not less "pro-life" than the minority whose consciences demand more rigid and vitalistic criteria, and it is a calumny to allege that they are. In fact, the National Right to Life Committee, the American College of Pro-Life Obstetricians, the American Association of Pro-Life Pediatricians, The National Commission on Human Life, and Americans United for Life all have expressed agreement with brain-based standards for the determination of death.⁶ The debate about brain death should be elevated to what it truly is — that is a scientific dialogue about the significance of certain irreversible losses of function. It is not a debate pitting predatory transplant surgeons and cynical grave robbers against a small embattled minority of purists and "legitimate" protectors of the sanctity of human life and should not be portrayed as such, even by innuendo.

Dr. Shewmon comments on the favorable reception given by audiences at international meetings to his disenchantment with brain-based criteria for the declaration of death.¹ It should not be inferred, however, that the rejection of brain-based criteria is necessarily a call for stricter standards. Several of the authorities quoted by Dr. Shewmon are on record in the literature as proposing that since total brain death does not bear meticulous scientific scrutiny, that we can therefore assume that neocortical loss of function is equally valid in qualifying donors.¹⁷ Specifically, there has been a call for the recognition that patients in the so-called persistent vegetative state be qualified to donate organs for transplantation despite their having

brain stem function. This is, of course, merely a permutation of the well-orchestrated effort (at one time endorsed by the American Medical Association Counsel on Ethical Affairs) to allow the donation of unpaired vital organs from "brain absent" anencephalic newborns.¹⁸

Dr. Shewmon correctly states that the medical community has fallen into the logical fallacy of accepting that *absence of evidence* of conscious activity constitutes *evidence of absence*. Recent experimental studies indicating irrefutable evidence of retained function of the neocortex in patients in persistent vegetative states¹⁹ reinforces this reality. Even in patients in whom the cerebral cortex is physically missing, this fallacy can be demonstrated. Dr. Shewmon points to his experience with hydranencephaly in which children who lack cerebral development can yet demonstrate conscious interactive activity. I have had a similar experience in my own practice with a hydranencephalic child. During the AMA annual meeting in 1996, the AMA Council on Ethical Affairs held a hearing on the subject of anencephalic donors. There was dramatic testimony from a woman who was the grandmother of an anencephalic child as well as an educator with a Ph.D. in Child Development. This woman described her ability to elicit evidence for conscious abstraction ability in her grandchild who survived six months under close observation and stimulation. Both conditions, hydranencephaly and anencephaly can demonstrate significant plasticity in neuronal development. The experience with these allegedly "brain absent" infants as well as our burgeoning experience with suppressed conscious activity in comatose adults strongly recommend against neocortical death as a standard.

British neurologists have maintained that the essence of "whole-brain" death is "brain stem" death since it is in the brain stem (including the hypothalamus) that somatic functions are integrated and consciousness is controlled by way of brain stem activation of cerebral hemispheres. The work of Pallis^{20, 21} in particular has endorsed brain stem death as the "physiological kernel" of brain death and the validity of declaring death on the basis of the evaluation of six critical brain stem reflexes plus the apnea test. Byrne and Nilges²² have advocated extending the definition of brain stem death to the evaluation of *fourteen* reflexes plus the apnea test. In

evaluating loss of function, the critical distinction between *intrinsic irreversibility* of loss of function (physical destruction) versus *extrinsic irreversibility* (intact structure) must be preserved.¹ Whole brain formulations which included destruction of the pallium and diencephalon would enhance the reliability of the determination of death as compared to brain stem death.

The major impediment to the acceptance of brain-based standards for the determination of death drives from the field of cardiac transplantation. The reluctance to remove a "beating heart" from a donor declared dead on the basis of irreversible cessation of total brain function is largely intuitive and related to the ancient tradition of equating the end of life with the cessation of heartbeat. The need to overcome the powerful aversion to the removal of an actively beating heart among members of the transplant team has led to the development of the "Pittsburgh Protocol" and other procedures for the establishment of "non-heart-beating" cadaver donors.²³ Numerous transplant centers throughout the country are now adopting strategies for 1) the anticipation of impending cardiac failure 2) undertaking measures to guarantee proper organ perfusion and preservation, and then 3) declaring death after two minutes of asystole. Dr. Shewmon has entertained a modification of the Pittsburgh Protocol to allow for twenty minutes of systole prior to removal of the unpaired vital organs.¹ In either event, it is difficult to escape the conclusion that the protocol is more for the benefit of the spectators in the transplant team than for the donor. The ceremonial awaiting of a cardiac basis for declaring death would not necessarily improve upon the intellectual honesty or the respect for human life inherent in the acceptance of brain-based standards. Disclaimers to the contrary, the Byrne standard or the new Shewmon standard would effectively end 90% of all human organ transplantation, and possibly 100% of unpaired vital organ transplantation. This would not be an unacceptable price to pay if the result were to be the restoration of a societal respect for the sanctity of human life that had somehow been lost in the acceptance of whole-brain death as tantamount to death of the person.

I believe that respect for the sanctity of human life and the declaration of death by whole-brain standards are not mutually exclusive. If total destruction of the circulatory and respiratory

systems plus total destruction of the whole brain were to be scrupulously observed as the *sine qua non* of declaring death, respect for life would not necessarily improve since the logistical problems created in end of life decision making would be monumental. The small margin of increased certitude about the factual occurrence of death would be achieved at the expense of clinical chaos at the bedside. Most current polls indicate that 70% of lay people and 50% of physicians already endorse the concept of doctors killing patients through assisted suicide.¹⁴ Any system which would increase the public perception of futile vitalism or ineffective technological intrusion into the determination of death might well be counter-productive to the preservation of respect for end of life patients. It might also be a handicap in the crucial battle against euthanasia.

In the words of Rabbi Immanuel Jacobvits, "If human life has infinite value, then any small fraction of human life has infinite value since any small part of infinity is still infinite." No live person should be treated as dead until truly dead. Death should not be declared until (a) the spontaneous functions of the heart and breathing have ceased or (b) there is irreversible arrest of all brain activity. This is the standard currently accepted by the majority of physicians including Catholic physicians. It is a position enunciated in the Charter for Health Care Workers²⁴ which was derivative of the Pontifical Academy for Life and the Congregation for the Doctrine of the Faith. The discussion of the issue of determination of death should continue in an atmosphere of mutual respect and a search for the truth.

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