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Contributions to the biophilosophical foundations of brain death criterion: an approach from anthropological realism

Contribucions a la fonamentació biofilosòfica del criteri de mort cerebral: una aproximació des del realisme antropològic

Contribuciones a la fundamentación biofilosófica del criterio de muerte cerebral: una aproximación desde el realismo antropológico

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Abstract

Since the criterion of brain death is continually debated, and there are even proposals for a change from a whole-brain criterion to a brain-as-a-whole criterion, more rigorous anthropological analyses are required. Along these lines, this article brings into dialogue two of the main philosophical foundations of the current brain death criterion. One is the emergentist position, held by the renowned neurologist James Bernat; another is the philosophical realism stance elaborated from Aquinas's exposition on the rational soul's unitive function as body's substantial form. It is shown that the view of the organism as a unit of body and soul is consistent with the recent discoveries of biology about brain function and gives an adequate explanation that overcomes the materialistic assumptions of emergentism. Therefore, an ontological viewpoint that coherently combines the Thomistic explanation of human nature with contemporary neurobiological data and presupposes a comprehensive anthropological view of man provides grounds for the brain death criterion to continue to be recognized as an ethically legitimate rule. Moreover, this approach confers an adequate framework for developing laws related to this controversial topic.

Keywords: brain death; organism as a whole; brain as a whole; death determination; philosophical realism; death criterion.

Resum

Atès que el criteri de mort cerebral és contínuament debatut i fins i tot hi ha propostes de canvi d'un criteri de mort cerebral total a un cessament de la funció del cervell en el seu conjunt, més rigoroses anàlisis antropològiques són requerits. En aquesta línia, aquest article posa en diàleg dos de les principals fonamentacions biofilosòfiques de l'actual criteri de mort cerebral. Una és la posició emergentista, sostinguda pel reconegut neuròleg James Bernat; una altra és la postura del realisme filosòfic, elaborada a partir de l'exposició de Tomàs d'Aquino sobre la funció unitiva de l'ànima racional com a forma substancial del cos. Es mostra que la visió de l'organisme com a unitat de cos i ànima és conforme amb els nous descobriments de la biologia sobre el funcionament del cervell i dona una explicació adequada que supera els supòsits materialistes del emergentisme. Per tant, una postura ontològica que combina de manera coherent l'explicació tomista de la naturalesa humana amb dades neurobiològiques contemporànies i pressuposa una visió antropològica integral de l'home dona fonaments perquè el criteri de mort cerebral continuï sent reconegut com a regla legítima des d'un punt de vista ètic. A més, aquesta aproximació proporciona un adequat marc per al desenvolupament de lleis relacionades amb aquest controvetit tema.

Paraules clau: mort cerebral; organisme com un tot; cervell com un tot; determinació de la mort; realisme filosòfic; criteri de mort.

Resumen

Dado que el criterio de muerte cerebral es continuamente debatido e incluso hay propuestas de cambio de un criterio de muerte cerebral total a un cese de la función del cerebro en su conjunto, más rigurosos análisis antropológicos son requeridos. En esta línea, este artículo pone en diálogo dos de las principales fundamentaciones biofilosóficas del actual criterio de muerte cerebral. Una es la posición emergentista, sostenida por el reconocido neurólogo James Bernat; otra es la postura del realismo filosófico, elaborada a partir de la exposición de Tomás de Aquino sobre la función unitiva del alma racional como forma sustancial del cuerpo. Se muestra que la visión del organismo como unidad de cuerpo y alma es acorde con los nuevos descubrimientos de la biología acerca del funcionamiento del cerebro y da una explicación adecuada que supera los supuestos materialistas del emergentismo. Por lo tanto, una postura ontológica que combina de manera coherente la explicación tomista de la naturaleza humana con datos neurobiológicos contemporáneos y presupone una visión antropológica integral del hombre da fundamentos para que el criterio de muerte cerebral siga siendo reconocido como regla legítima desde un punto de vista ético. Además, esta aproximación proporciona un adecuado marco para el desarrollo de leyes relacionadas con este controversial tema.

Palabras clave: muerte cerebral; organismo como un todo; cerebro como un todo; determinación de la muerte; realismo filosófico; criterio de muerte.

1. Introduction

In 1968, the Ad Hoc Committee of the Harvard University Medical School published a report in which a new death criterion popularly known as "brain death" was presented.[1] That article did not give a new definition of death and the neurological criterion was added to the traditional criterion of cardiorespiratory death.

To support this new criterion, in 1981, one of the greatest exponents of the subject, the neurologist James Bernat, along with other experts, emphasized that brain death implied the loss of an essential organism activity, specifically the integrating unit, and therefore, it was a clear sign of the organism death.[2]

However, new evidence has been showing that the whole brain is not entirely dead in the case of brain death, and, therefore, it is in doubt that all integrative brain functions have been permanently lost in this situation.[3]

In 2014, Bernat recognized the difficulty of supporting the integrating activity as the most radical foundation and stated that the loss of the organism itself is what matters for a definition of death.[4] "The organism itself" supposes a fundamental distinction between "the whole organism" and "the organism as a whole." An organism can lose parts or endure the deprivation of a function in a localized region and, therefore, not be a complete organism according to the standards of its species. However, it will remain an organism and, consequently, a whole.

Some authors claimed that if this notion of wholeness is transferred to the brain, it would be possible to affirm analogically that the functioning of the brain as a whole does not refer to the functioning of all parts of the brain but to a set of critical neural systems present in the cerebral cortex, the cerebellum and the brainstem that make the brain a unit capable of unifying the entire body.[5] These components must be irreversibly nonfunctional for the brain as a whole, and consequently, the human being, to be considered dead.

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[1] Cf. A definition of irreversible coma. Report of the Ad Hoc Committee of the Harvard Medical School to Examine the Definition of Brain Death. (1968). JAMA, 205(6), 337-340. doi:10.1001/jama.1968.03140320031009.

[2] Cf. Bernat, J. L., Culver, C. M., & Gert, B. (1981). On the Definition and Criterion of Death. *Annals of Internal Medicine*, 94(3), 389–394. https://doi.org/10.7326/0003-4819-94-3-389.

[3] Cf. Dalle Ave, A. L., & Bernat, J. L. (2020). Inconsistencies Between the Criterion and Tests for Brain Death. *Journal of Intensive Care Medicine*, 35(8), 772–780. https://doi.org/10.1177/0885066618784268

[4] Cf. Bernat, J. L. (2014). Whither Brain Death? The American Journal of Bioethics, 14(8), 3–8. https://doi.org/10.1080/15265161.2014.925153.

[5] Christopher Pallis cited the brain as a whole as the conceptual foundation for brain stem death. Cf. Pallis, C. (1990). Brainstem Death. In Vinken, P.J. & Bruyn, G.W. (Ed.), *Handbook of Clinical Neurology* (vol. 57), 441-496. Elsevier Science Publisher. Previously, he had developed the following analogy: "The irreversible cessation of heartbeat and respiration implies death of the patient as a whole. It

Despite the efforts to respond to the questions in this area, and although doctors have generally adopted the brain death criterion, this manner of establishing death remains a significant debate today. Within the persistent controversies surrounding death determination on a neurological basis, Bernat (2019) stated that one of the principal current limitations is that "the concepts of organism as a whole and brain as a whole remain vague and in need of rigorous biophilosophical analysis" (p. 347). More recently, Bernat (2023a) claimed that "this conceptual question continues to be debated within the halls of academia where it remains a source of heated controversy" (p. 32). Simultaneously, brain death "is at the nexus of current controversy as the US Uniform Law Commission (ULC) seeks to revise the Uniform 1981 Determination of Death Act (UDDA)" (Bernat, 2023a, p. 30), while "legal challenges to the determination of death using neurologic criteria are increasing" (Gardiner et al., 2023, p. 469).

Along these lines, Omelianchuk (2021) indicated that "recent defenses of biological death as signified by total brain failure [...] do not address the fundamental questions surrounding human ontology" (p. 532). Therefore, it is increasingly necessary to deepen the subject to better understand of what happens concerning the brain at the end of life.

Consequently, this article reviews the fundamental concepts present in the current neuroethical discussion about brain death and the anthropological foundations that support the choice of an appropriate criterion for determining human death. Afterward, we analyze what aspects must be considered to move from a whole-brain criterion to a brain-as-a-whole criterion. The guiding principle of the article is that a change in the criterion must be consistent with the anthropological foundations that underlies an adequate definition of death and ethical and legal practices used in this area.

2. The organism as a whole

The biologist Jacques Loeb introduced the biophilosophical concept of "organism as a whole" for the first time in 1916. This notion refers not to the whole organism (sum of parts), but rather to those functions greater than the sum of the parts. Initially, Bernat (1981) described "wholeness" as follows:

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does not necessarily imply the immediate death of every cell in the body. The irreversible cessation of brain stem function implies death of the brain as a whole. It does not necessarily imply death of every cell in the brain." (Pallis, C. (1983). ABC of Brain Stem Death. The Declaration of Death. *British Medical Journal, 286*(6358), 39. https://doi.org/10.1136/bmj.286.6358.39).

> *The functioning of the organism as a whole means the spontaneous and innate activities carried out by the integration of all or most subsystems (for example, neuroendocrine control), and at least limited response to the environment (for example, temperature change and responses to light and sound). (p. 390)*

Subsequently, he established a triad of distinct and complementary critical functions of an organism as a whole, whose cessations are necessary and sufficient to constitute the loss of the organism's functional unit: autonomic regulation of circulation and spontaneous breathing, integrative processes that ensure homeostasis, and consciousness.[6] When an organism loses these three crucial functions permanently, death occurs. Correlatively, presence of any one of these factors constitutes sufficient evidence for life.

On this point, a few caveats are necessary. Bernat (2018) bases this theory on emergentism, according to which an organism spontaneously generates emergent functions that create its unity and wholeness: "The organism as a whole refers […] to the emergent functions that become manifest when normally functioning organ ensembles work in concert" (p. 19). He explains

> *An emergent function is a property of a whole that is neither located in nor can be reducible to any of its parts [...] Emergent functions are a product solely of the unified whole, and they remain distinct from and hierarchically greater than the functions of any of its parts [...] the most exquisite and ineffable emergent function [is] the conscious awareness. (p. 19-20)*

Emergentism foundations present difficulties from the ontological point of view.[7] Bernat's initial attempt to connect integration to wholeness is legitimate, since separating the intrinsic link between integration and wholeness creates more problems than it solves. However, in order to explain the intrinsic relationship between wholeness and integration, the organism as unity of body and soul gives a more adequate explanation that overcomes the materialist assumptions of emergentism. In this case, the organism as a whole is greater than the sum of material body parts, and the soul is not a set of emergent properties but the organism's substantial form and the ultimate foundation of its life. This governing principle may be called either soul or otherwise; nevertheless, it is clear that this principle exists prior to what causes it, and the principle itself cannot be the result of somatic complexity, for what has to be explained is the said complexity.

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[6] Cf. Bernat, J. L. (1998). A Defense of the Whole-brain Concept of Death. The Hastings Center Report, 28(2), 18. https://doi.org/10.2307/3527567.

[7] Since all the physical-chemical properties of the natural systems are fundamentally emergent, Roth maintains that emergentism is "trivial materialism" and, consequently, a body-spirit problem reductionism. Cf. Roth, G. (1997). *Das Gehirn und seine Wirklichkeit: kognitive Neurobiologie und ihre philosophischen Konsequenzen*. Suhrkamp, 291-293.

The soul is the source of life and the unique organizing principle of the body. On one hand, it allows from breathing and circulating blood to thinking and choosing; on the other hand, it unifies these several activities into an integrated system or whole. In this line, an organism consists of a teleological center that directs and regulates life processes. According to Omelianchuck (2021), this implies that a living human being has "a capacity for self-directedness or self-movement towards the distinctively human end of rational thought and action" (p. 542). Continuing, he claims that

> *Assuming organisms are substances, the whole is metaphysically prior to the parts, and the parts receive their "parthood" by virtue of being unified in the appropriate way by the activity of the whole […] An organism as a whole is an enduring, self-directed and self-moving entity in which its parts derive their identity and function from its internal structure, and it develops by virtue of its own capacities and powers latent in itself according to an information-rich design plan intrinsic to its kind towards a distinctive end or goal (p. 544).*

This approach's contribution to this debate is particularly valuable because "its metaphysical structure is well suited for taking full account of the empirical data […] it allows that the biological information on brain death be integrated into the philosophical discussion on human death."[8] At the moment of death, the soul separates from the body, consequently, the remaining organism loses its inherent cohesion and its radical capability for human actions. Therefore, death of the organism as a whole equates to human death.

In addition, this philosophical position allows us to establish links with the crucial role that the brain plays in the organism. In this anthropological vision of body functioning, the rational soul operates through a primary organ (i.e., the first material cause of corporal self-movement). Therefore, the causal primary organ function is an integrating activity and an essential sign of presence for the rational soul. Thomas Aquinas identifies the heart as this primary organ.[9] Despite the fact that current science indicates brain, not heart, is the central organ, necessary for a living body to exist as an integrated organism, the basic theory behind Tomas's criteria for a primary organ can be accurately applied without difficulty. For Thomas Aquinas, the soul "moves" or "operates" (*operatur*) the body only through the primary organ. Furthermore, that organ is the

[8] Smith, P. (1990). Brain Death: A Thomistic Appraisal. *Angelicum* 67(1), 5.

[9] "To live stands for the operation of the soul, which it produces in the heart insofar as it is a mover [...] and it infuses this life first in the heart, and afterwards in all the other parts [of the body]." Aquinas, T. (1225-1274). *Scriptum Super Libros Sententiarum Magistri Petri Lombardi Episcopi Parisiensis*. In Mandonnet, P. and Moos, M. (Ed.) (1929), Book I, Distinction 8, Article 3, Answer ad 3. Lethielleux (Original work published ca. 1252). About the interpretation of this quote, cf. Eberl, J. (2006). *Thomistic Principles and Bioethics*. Routledge, 44.

"ruler" of the other parts of the body, in the sense that it acts as a governor who ordains his city through laws. Finally, Thomas points out that the other body parts depend on the primary organ. Advances in biology evidence that the brain is the operational source of autonomous and voluntary vital functions. It regulates these functions and orders them to sustain the existence and activity of the whole body. Moreover, brain is the critical organ on which other vital organs, including heart and lungs, functionally depend.

The brain also depends on the rest of the body, principally heart and lungs. To survive and function, "the brain must sense a change in oxygen content or acidity of the blood before sending a nervous impulse to the lungs [actually the diaphragm] to activate a breath" (Accad, 2015, p. 231). However, while the brain depends on the body to support its functions, the heart and lungs depend on the coordination of brain signals to work at all. Although other organs play a role in organism maintenance, the brain constantly facilitates their contribution. Thus, if brain activity ceases, there is no longer the integration to make possible the unity of the organism. Correspondingly, metaphysical principles, in harmony with contemporary biological data, consistently support the criterion of brain death, where cessation of brain functions results in death.

Despite the differences in anthropological foundations, a few similarities can be observed between the two proposals mentioned above. Some elements of Bernat's description align with the Thomistic point of view that identifies the unified human existence as a body informed by a soul with rational, sensitive, and vegetative capabilities. The soul's rational and sensitive capacities correspond with Bernat's "consciousness." The so-called vegetative capacities of the soul can be associated with spontaneous breathing, autonomous circulation, and integrative functions. Correspondingly, the loss of certain aspects observed by Bernat can be consistently explained if we resort to a theory where the separation of a rational soul from her body does not occur until the body ceases to function as a unified and integrated organism, that is, when the irreversible loss of a human being's rational, sensitive, and vegetative capacities occurs.

Since the brain is the organ directly correlated with Bernat's three sets of critical functions and since these functions correspond to the classic understanding of the soul's capacities, the irreversible cessation of whole brain function indicates death and can be understood as the event that shows the separation of the soul from the body. In fact, Bernat (2014) states: "The brain-dead human organism has irreversibly lost its totality, completion, indivisibility, self-reference, and identity. It no longer can ever again function as a whole and therefore is dead." (p. 6). Similarly, Omelianchuk (2021) affirms,

> *Death, then, is the end of the organism as a self-moving whole, meaning there is no more entity that has this active internal structure by which its parts receive their identity and function, no more development or activity toward a kind-distinctive end by virtue of its own capacities and powers. This sort of entity does not persist [...] after total brain failure. (p. 544).*

3. Brain as subject of death attribution

Going from a concept of whole brain death to brain as a whole death raises the question of whether it is valid to make an analogy between human being and brain to talk about the subject of attribution of death. By focusing linguistically on the brain, are we heading towards a solution or creating a new problem?

At first, it is important to note that experimental science is carried out fragmentarily, analyzing particular phenomena, and, therefore, takes the risk of losing sight of the unitary processes in nature. These processes consist of coordination of harmonized phases whose unity can only be explained because specific potentialities and information guide the deployment of natural dynamism. Every unitary process has holistic characteristics and takes place properly only in organisms due to the degree of unity and individuation.

Components like cells behave like organisms. Each cell has a certain autonomy and unitary processes that make possible cell function and relationships with other cells are produced continuously. Something similar happens in tissues, organs, and systems with higher degrees of organization, where more complex and coordinated processes occur.

Unit processes are also functional. Functionality refers to the activity of the parts in accordance with the whole. Nervous coordination, hormonal coordination, and immune defense are human functions. Although functions may be attributed to a lower structure, such as an organ or system, they are ultimately actions of the organism.

In neuroscience, the tendency to attribute psychological predicates to the brain is called "the mereological fallacy." Human attributes can only be predicated on the human being. Already in the early 2000s, Max Bennett and Peter Hacker had pointed out that consciousness cannot properly be predicated on the brain but of the human subject because what is awake and dreaming is not the brain but the subject.[10] More accurately, the brain is not the organ of consciousness,

[10] "Mereology" derives from Greek and refers to the logic of part-whole relations. Bennett and Hacker claim, "Neurosciences can discover the neural preconditions for the possibility of the distinctively human power of thought and reasoning [...] What it cannot do

knowledge, or perception; whoever feels, reasons, or perceives is the human being. Analogically, we can affirm that it is neither the brain nor heart, but rather the human being that dies. It is correct to state that death of the human being implies loss of fundamental unity of the two constitutional aspects (corporeal and spiritual) and, consequently, destruction of the organism.

The fact that certain bodily functions indicate life has led some authors to think that an organ can be equated with a whole. For example, after the recognition of the brain death criterion as a valid sign for determining death, philosophical statements appeared, asserting an identity between brain and personal subject. These theories excessively valued the brain as the organ in which all characteristics that enable us to consider ourselves human beings are condensed and practically claimed that we are essentially our brains, disregarding the rest of the body concerning personal identity.[11]

Although recent neuroethical discussions focus closely on the brain, it is important to clarify that the reality of the human being cannot be fully explained by neuroreductionism. On the contrary, philosophical realism affirms that the brain is part of a holistic system that includes the soul and body of a subject interacting with the outside world. The immaterial principle is not confined exclusively to one organ and is not reducible to the brain. The soul is present throughout the entire body as a unifying principle of life. However, in order to exercise its function, the soul requires organic conditions: not only a central nervous system but also an interactive human body. We are made up of our brains, but we are not identical to them. The brain is necessary but not sufficient to explain the physical and psychological properties that form a unique individual.

Although the distinction between psychological and neural elements is ineliminable, it is also clear that these elements are integrated (for instance, certain lesions in the brain impede the performance of specific cognitive acts, and spiritual tasks like deliberation have an observable neural correlate). The subject's acts are psychosomatic acts and, moreover, unique (there are not two separate acts attributable to two different realities). It is, therefore, more appropriate to distinguish psychosomatic levels. Considering integrated psychosomatic acts makes it possible to understand that actions such as remembering, imagining, or even thinking and loving are spiritual acts, which at the same time are deeply linked to human corporeality. They are not two operations

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is replace the wide range of ordinary psychological explanations of human activities in terms of reasons, intentions, purposes, goals, values, and conventions by neurological explanations." Bennett, M. & Hacker, P. (2003). *Philosophical Foundations of Neuroscience*. Blackwell, 15.

[11] "You, your joys and your sorrows, your memories, and your ambitions, your sense of personal identity and free will, are in fact no more than the behavior of a vast assembly of nerve cells and their associated molecules. . . This hypothesis is so alien to the ideas of most people today that it can truly be called astonishing." Crick, F. (1994). *The Astonishing Hypothesis: The Scientific Search for the Soul*. Touchstone, 3.

or actions but only one spiritual-mental act with a neuronal and physiological expression. Feeling pain, for example, is a single act, not two acts. It is strictly inaccurate to distinguish a psychological "part" and another physical "part"; we do this analytically, from the viewpoint of our knowledge. It is more appropriate to say that there is "correspondence" between psychological and neuronal pain. In this sense, reducing pain to its nerve base is a limited and impoverishing approach (the sensory act is more than the structure of organized matter).

The limits or boundaries between the distinct levels of the same act attributed to the subject are not always as clear and distinct as a Cartesian proposal pretends. Natural physical things are unitary structures of multiple elements. The structuring of living things is not a set of mere combinations of elements. However, it implies the existence of a unitary principle (not a "thing") that organizes these parts and gives them particular properties. When these elements are separated from the unitary and organized whole, they lose their character of integral parts and acquire independent existence, passing to a more elementary and straightforward natural level.

Conclusively and strictly speaking, the human being lives and dies. Only by analogy can we speak about the brain as a subject of attribution of death.

4. Function of the brain as a whole

In the same way that various authors discussed whether certain functions could be attributed exclusively to the brain or were characteristic of the human subject, there has been a debate about whether mental functions pertain to a specific brain area or are performed throughout the entire brain. So-called "localizationists" authors stated that mental functions are associated with punctual brain structures. On the other hand, some authors adopted an "anti-localizationist" perspective, denied the existence of specific brain centers for different mental processes, and admitted a collaborative work of the cortical regions that jointly originate the different cerebral functions. More recently, new holistic approaches have been developed.[12] According to biomedical research, it is possible nowadays to delineate a system—not a specific cerebral region—

[12] Aleksander Romanovich Luria made one of the most consistent foundations that overcome the localizationism-antilocalizationism dichotomy. He indicated that human mental processes are complex functional systems not located in strict areas but rather take place through the participation of a group of brain structures that work in concert, each of which makes its particular contribution to the organization of this functional system. Participation in three functional units of the brain is necessary for all types of mental activity, from regulating tone or wakefulness, obtaining, processing, and storing information from the outside world to programming, regulating, and verifying mental activity. For a synthesis of Luria's thought, see García Rodríguez, R.; González Ramírez, V. (2014). Las funciones psíquicas superiores, la corteza cerebral y la cultura. Reflexiones a partir del pensamiento de A. R. Luria. *En-claves del Pensamiento* 8(15), 39–62.

descriptively termed the mind-body integration system.[13] This integration system characterizes the highest hierarchical level of organization in the organism and includes brain and brainstem integrated structures that determine the capacity to function in a unified manner. This integration is inseparable from other functions, such as the generation of consciousness. The destruction of this critical brain system determines the permanent loss of the ability to perform encephalon and organism essential functions in a coordinated way. The functions of this structure include the ability to integrate and regulate the communication systems of the organism (nervous, hormonal, immunological), adaptive and behavioral interaction with the external environment, and the mechanisms that control the homeostasis of the internal environment.

The existence of this vital center allows us to formulate with greater clarity the concepts of the irreplaceability and criticality of the brain and, consequently, the ontological level pertinent to the definition and determination of death. It explains that the brain is the privileged organ where the functional synthesis of the human body occurs.

At the same time, it allows us to recognize that the brain works as a unit, whose results imply the collaboration of various brain areas. For instance, just as wakefulness is not simply related to brainstem reticular formation function, consciousness contents are not only related to cerebral cortex functions. Diverse interconnections between the neocortex, subcortical structures, and the brainstem are necessary to produce and integrate both components of consciousness. Because of this, consciousness does not simply relate to upper or lower brain structures in a one-to-one manner, and its definition does not directly relate to the higher brain; instead, the physical basis of consciousness depends on the entire brain morphology and physiology.[14]

Collecting these conclusions from neurology, we can affirm that irreversible cessation of brain-as-a-whole functioning is a sign that the death of the human being has occurred. Some isolated residual activity may remain in the brain after death. However, this vestigial and remaining activity does not indicate life.[15] Bernat (2023b) states that the introduction of a brain-as-a-whole criterion retains

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[13] Cf. Garcia, O. (1998). A new formulation of death and its relevance to medical law. *Medicine and Law, 17*(4), 493–501.

[14] Consciousness is not produced in a singular location in the brain, but rather, diffuse connections between the cerebral cortex, subcortical regions, and reticular activating ascending system provide the physiological nucleus of consciousness. Development and integration of the elements of consciousness require cortico-subcortical connections. Cf. Meléndez Minobis, M., Dujarric Martínez, M., Fariñas Rodríguez, L., Posada García, A., & Milán Companioni, D. (2005). Implicaciones éticas de la muerte cerebral y los trasplantes de órganos. *Rev Cubana Invest Biomed, 24*(1): 60-8. Roth also claims that brain centers outside the cerebral cortex—"subcortical" parts of the brain—are indispensable and actively involved in the conscious processes. Cf. Roth, G. (2000). Ist der Hirntod gleichbedeutend mit dem Tod des Menschen? In Firnkorn, H., *Hirntod als Todeskriterium.* Schattauer Verlagsgesellschaft, 16.

[15] The US President's Commission had noted in its 1981 Report that isolated metabolic or electrical activity in dispersed cells is not a

> *the essential elements of the whole-brain criterion but would permit the persistence of random, disorganized, scattered EEG signals and the continuation of hypothalamic neurosecretion, though not other hypothalamic functions. The comparatively minor brain functions would be allowed to continue because essential brain functions would cease irreversibly. (p. 272)*

To ensure that brain-as-a-whole criterion be considered a valid scientific-medical criterion to establish the end of organismal life, the criterion must be based on an integral image of human being as a soul-body unit centered on itself, a totality in which the brain plays an inalienable role. In this regard, this criterion can successfully support a framework for legal clinical procedures and government directives on death declaration. Moreover, according to this criterion, Bernat (2023b) clarifies that "essential brain functions have ceased irreversibly but that the determination does not require the ablation of every brain function or the death of every neuron." (p. 272-273). This is compatible with a biophilosophical anthropological posture based on metaphysical principles that explain the unity of the organism.

It is convenient to clarify that the term "brain-as-a-whole criterion" may be misleading because it can wrongly imply that only the brain has died and not the human being or that more than one kind of death exists— rather more than one way to determine death. To avoid further public confusion over its meaning, this expression requires an educational process of citizens and a deeper study of academics.

5. Conclusions

Verifying death is a medical task, which has a philosophical basis. Advances in neurology allow us to recognize that the brain functions holistically. With the irreversible cessation of the brain as a whole integrated function, the organism ceases to be a unified whole, and death occurs. Although some residual activity may remain for a time in the brain after death, brain-as-a-whole criterion can be recognized as a solid criterion for establishing death.

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determinate sign of a living patient. Cf. President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research (1981). *Defining Death. A Report on the Medical, Legal and Ethical Issues in the Determination of Death.* U.S. Government Printing Office, 75. https://repository.library.georgetown.edu/bitstream/handle/10822/559345/defining_death.pdf?sequence=1&isAllowed=y. Subsequently, Wijdicks illustrated that "pituitary blood flow arises from extracranial sources, which is preserved in raised intracranial pressure and that preservation of neurohypophyseal functioning, is not inconsistent with the whole-brain formulation of brain-death." Wijdicks, E. (2000). *Brain Death*. Lippincott Williams and Wilkins, 29.

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