

# MORE ABOUT THE DETERMINATION OF DEATH BY NEUROLOGIC CRITERIA

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## Author's Highlights:

Dr. Calixto Machado graduated as MD in 1976. He continued his medical training to become Specialist in Neurology and Clinical Neurophysiology, First Degree in 1980, and Second Degree in 1984. In 1990 he became the youngest Dr. in Sciences in his country. Dr. Machado received clinical training in specialized neurology centers in Sweden, Italy, Austria, and USA

In 1992, he was the first Cuban neurologist who was a member of the American Academy of Neurology (AAN), nominated as a Corresponding Fellow. He has been awarded 15 times by the Best Annual Scientific Medical Research in Cuba. In 2005 he received the American Academy of Neurology "Lawrence McHenry Award", and in 2011, he was awarded as the "Researcher of Year" by the International Academy for Child Brain Development (Philadelphia, USA), and by the International Association of Functional Neurology and Rehabilitation (Orlando, USA). These were the first time that a Hispanic neurologist, and a neuroscientist from a developing country, received those recognitions.

He is Senior Professor and Researcher at the Institute of Neurology and Neurosurgery, Havana, Cuba. He is actually the President of the Cuban Society of Clinical Neurophysiology and of the National Commission for the Determination of and Certification of Death.

He has been the President of the Organizing Committee of the International Symposia on Brain Death and Disorders of Consciousness, since the 90's (8 symposia). These conferences have gathered hundreds of foreign delegates from the whole globe.

During the last 30 years he has run many research protocols on subjects, such as: brain death, coma, persistent vegetative states and other disorders of consciousness, stroke, autism, etc. He has published more than 400 peer reviewed articles, book chapters, and 4 books. His Book "Brain Death: A Reappraisal" was received with great enthusiasm among neurologist, neurosurgeons, intensivists, and surgeons specialized in transplants. He is considered one of the most productive investigators in the area of brain death and disorders of consciousness.

Declarations of interest: none

Lewis et al. published an important and timely necessary article about the determination of death by neurological criteria, revising the Uniform Determination of Death.<sup>1</sup>

The acceptance of brain death (BD) has been progressively accepted beginning at the late 1950s.<sup>2-13</sup> Nonetheless, contentious brain-death cases have recently raised new controversies about the diagnosis of BD, such as the Jahi McMath case, extensively covered by the US and international press.<sup>14-24</sup> Jahi McMath meant a terrible tragedy for her and her family. But further than this gloomy story, the case has also raised confusion and challenging qualms about a fundamental query: how we confirm whether a person is dead or alive?<sup>20, 23, 25-28</sup>

Since 1981, the Uniform Determination of Death Act (UDDA) has served as the legal foundation for the medical practice of determining death.<sup>29, 30</sup> But, although death by neurologic criteria is considered legal death throughout the United States, several recent lawsuits have quizzed the rightfulness the authority of the UDDA to declare death by neurological criteria.<sup>18, 31-36</sup> This issue explains the importance of Lewis's et al. paper.<sup>1</sup>

In this article I want to present the historical procedure for issuing a law in Cuba for the determination and certification of death.<sup>20, 24, 37-43</sup> Of course, it is impossible to compare our country with USA. Cuba is a small and developing country, in which a law encompasses a national scenery, in contrast with USA, a multistate nation.

## **Cuban Law for the Determination of Death**

### *The Civil Code*

The Cuban Civil Code has undergone several historical changes regarding the determination of death.<sup>24, 25, 40, 42, 44</sup>

The Spanish Civil Code, established in Cuba since 1889, stated in Article 31:

*“Death occurs when the person is extinguished.”*

The subsequent Civil Code (Cuban Law 1175, March 9, 1965) stated<sup>40</sup>:

*“Death is the loss of every sign of life after a living birth.”*

The development of Article 26.1 of the present Civil Code (July 1987)<sup>25</sup> stated:

*“Physicians are the only professionals authorized to diagnose and certify death according to a norm established by the Ministry of Public Health.”*

*Distinguishing Features of Article 26.1 of the Current Cuban Civil Code)*<sup>24, 25, 41-</sup>

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- It does not define death.
- It specifies that physicians are the only professionals authorized to diagnose and certify death.
- It specifies that the Ministry of Public Health must provide a norm for the determination of death (clinical and instrumental criteria).
- The Cuban Parliament gave full responsibility to the

Ministry of Public Health to legalize the determination and certification of death.

### *Law Within a Ministry*

According to the Cuban Parliament, a resolution is a law that legalizes a working standard within any ministry and that could be signed and changed by the minister in function. Therefore, the Ministry of Public Health needed to respond to the present Civil Code, Article 26.1, by writing a resolution on this subject.<sup>25</sup>

For this reason, the Ministry of Public Health organized the National Commission for the Determination and Certification of Death at the beginning of the 1990's. Since that date I was nominated as the President of the Commission, and it was finally composed with representatives from multiple disciplines, including various medical and legal specialties. After several versions, the Commission wrote the final resolution, signed by the Minister of Public Health on August 27, 2001 (Fig 1).<sup>43</sup>

### **The main body of the norm contained the following points:** <sup>40, 43.</sup>

- Physicians diagnose death by documenting the “signs of death.”
- When the diagnosis of death is based on the irreversible loss of whole brain functions, medical specialists need to be accredited by the National Commission for the Determination and Certification of Death.
- Death is certified by the physician who diagnoses it. Physicians will register the moment of death upon completing the diagnostic procedure.

- The commission will annually review the diagnostic criteria of death and will propose changes or amendments, according to medical and technological advances in this area.



Figure 1. Cuban law for the determination and certification of death.

### *Diagnosis of Death*

The National Commission accepted only one kind of death<sup>39, 40, 45</sup>:

*The irreversible loss of whole brain functions, including the brainstem and the cerebral hemispheres.*

The Commission also recommended to consider my new definition of death, based on the patho-physiological mechanism for generation of consciousness:<sup>46-48</sup>

*Irreversible loss of the consciousness which provides the key human attributes and the highest level of control in the hierarchy of integrating functions within the human organism.*

This definition has as an anatomical and functional substratum:

*Irreversible destruction of the anatomic and functional substratum for the generation of both components of consciousness (arousal and awareness) throughout the whole brain.*

Although the Commission accepted that there is only kind of death (the *irreversible loss of whole brain functions, including the brainstem and the cerebral hemispheres*), also emphasized that there are several ways of diagnosing it, according to the place and environment where death occurs.<sup>40,</sup>

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1. Outside the intensive care environment (no ventilatory and cardio-circulatory support), where physicians apply the cardio-circulatory and respiratory criteria.
2. In forensic medicine circumstances physicians assess cadaveric signs. (They do not even need a stethoscope.)
3. In the intensive care environment (no ventilatory and cardio-circulatory support), when cardio-circulatory and/or respiratory arrest occurs physicians utilize the cardio-circulatory and respiratory criteria. When physicians suspect an irreversible loss of brain functions in heart-beating and ventilatory supported cases, BD diagnostic criteria are applied.

*Signs of Death:*

- I- Irreversible loss of respiratory function.
- II- Irreversible loss of cardio-circulatory functions.
- III- Algor mortis (postmortem coldness).
- IV- Livor mortis (postmortem lividity).
- V- Rigor mortis (postmortem rigidity).
- VI- Cadaveric spasm.
- VII- Loss of muscle contractions.
- VIII- Putrefaction.
- IX- BD diagnosis.

The commission adopted the view that the irreversible loss of cardiocirculatory and respiratory functions can only cause death when ischemia and anoxia are prolonged enough to produce an irreversible loss of functions of the whole brain.<sup>40, 49-51</sup>

Physicians diagnose death by finding the “signs of death.” Signs I and II correspond to the classic respiratory and cardiocirculatory functions, which can be applied in scenarios without an intensive care setting. Signs III to VIII are related to forensic circumstances. Sign IX corresponds to BD diagnosis

The description of the way to assess the signs of death, including BD diagnosis, according to our Commission is outside the scope of this article, and can be found elsewhere. <sup>38, 40, 49-52</sup>

The Commission also stated that any legal code of death should be completely separate from any norm governing organ transplants. In fact, in our legal norm, the word “transplant” is not cited.<sup>43, 53</sup>

## **Final remarks**

Lewis et al.<sup>1</sup> also clearly discussed the question about pituitary/hypothalamic function preservation in suspected brain-dead cases.<sup>54, 55</sup> In the case of Jahi McMath, the family's legal position assured that she was alive because in large part on continued hormonal function manifested by menstruation.<sup>18, 21-23</sup> On the contrary, I assured that Jahi McMath was not braindead, because ancillary tests performed 9 months after initial brain insult, showed conservation of intracranial structures, EEG activity, and autonomic reactivity to "Mother Talks" stimulus. I concluded that Jahi McMath represented a new state of disorder of consciousness, non-previously described, that I have termed: "responsive unawake syndrome" (RUS).<sup>20, 24, 56</sup> Nonetheless, the preservation of hormonal function in BD deserves further attention.<sup>57-59</sup>

It is necessary to finally remark that, although there is only one kind of human death, based on the irreversible loss of functions of the whole brain, there are several ways of diagnosing death, according to the scenario where death occurs. Nonetheless, it does not mean that there are different kinds of deaths.<sup>20, 24, 40, 60-63</sup>

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