

A Close Look at the Revised UDDA Proposed by the ULC Drafting Committee

The June 9, 2023 ULC revised UDDA (RUDDA) draft presents two options for the determination of death. An individual is dead if the individual has sustained:

Option 1: (1) irreversible cessation of circulatory and respiratory functions; or (2) irreversible cessation of all functions of the entire brain, including the brainstem.

Option 2: (1) permanent cessation of circulatory and respiratory functions; or (2) permanent (A) coma, (B) cessation of spontaneous respiratory functions, and (C) loss of brainstem reflexes.

Option 1 corresponds to the current Uniform Determination of Death Act (UDDA), and option 2, the proposed RUDDA. In both, clause (1) deals with circulatory death, and clause (2) deals with brain death (BD), i.e., death by neurological criteria (DNC). Compared to the current UDDA, the RUDDA introduces two significant changes:

(i) a radical departure from the requirement of irreversibility to a permanence standard in both circulatory death and BD/DNC.

(ii) a radical departure from the requirement of “irreversible cessation of *all* functions of the entire brain, including the brain stem” to a requirement of merely three features, “permanent coma, cessation of spontaneous respiratory functions, and loss of brainstem reflexes.”

As shown below, both of these radical changes contradict the scientific reality of death and entail a non-negligible risk of declaring a still living patient to be dead. Additionally, an important consideration is that the law on the determination of death should not have any connection (even if implicit) to organ donation-transplantation, because to do otherwise, could lead the public to distrust the practice of organ donation.

I. Why “irreversible” cannot be replaced by “permanent”

1. Death is an irreversible state that marks the end of the physiological process of dying. It is a scientific reality. It is irreversible because no mortal can return from being dead short of a miraculous intervention.

A human organism remains alive as long as it maintains its internal homeostasis to resist the tendency toward decay (i.e., entropy). Homeostasis refers to the regulation of a myriad of constituents of the body’s internal milieu within specific constraints; it is a dynamic process involving a whole host of mutually interdependent physiological functions.

Conversely, death is the point of no return where the human organism no longer has the capacity to maintain or restore homeostasis. The process of decay takes over: the temperature of a corpse quickly drops to the level of the ambient temperature and tell-tale signs of *rigor mortis* and *livor mortis* appear within a few hours. Resuscitative medical intervention cannot bring a corpse back from death; it can only interrupt the dying process in the still living person.

In contrast, the term “permanent,” in the context of the determination of death, refers to loss of function (e.g., circulation, brain function) that cannot resume spontaneously and will not be restored through intervention. An irreversible state cannot be reversed; it exists independently of our action or intent. In contrast, a permanent state will not be reversed because – to quote Alexander Capron’s statement in 1999 – “we choose not to reverse although we might have succeeded.” The language of “permanent” thus treats death as a legal or moral concept that relies on human intent or action. As such, it treats death as a social-medical-legal construct.

It has been argued that “permanent” is a valid stand-in for “irreversible” because it will progress in an inevitable sequence, leading to irreversibility. However, this only means that “permanent” is a prognosis of death and not a diagnosis of the irreversible state of death. Therefore, to claim that “permanent” can serve as a proxy for “irreversible” is to conflate prognosis with diagnosis.

2. Using the language of “permanent” to treat death as a legal or moral concept that merely relies on human intent or action violates the scientific reality that death is a state of a body. Moreover, a serious implication of “permanent” is that patients in identical physiological states (no heartbeat, no pulse, no breathing), would be considered alive or dead depending on whether resuscitation will or will not be attempted.

3. The medical practice that greatly benefits from the RUDDA’s language of “permanent” is organ donation-transplantation, in particular, donation after circulatory death (DCD).

Clause (1) of the current UDDA refers to traditional circulatory death – the kind of death that occurs at home, in hospices, or in hospital wards. In such contexts, the loss of vital functions has become irreversible because a significant period of time elapses between the time when the heartbeat, circulation, and respiration ceased, and the time when the patient is found dead and declared dead.

It has been argued that the UDDA (promulgated in 1981) intended “permanent” as an interpretation of “irreversible.” This is inconceivable because the appeal to “permanent” only appeared many years after the Pittsburgh protocol introduced DCD in 1993 for the purpose of increasing the organ donation pool. In DCD, the donor is taken to the operating room and prepped (ready for the organ procurement operation); he/she is rapidly weaned off life support. Once circulation stops, the patient is observed for 5 minutes (the usual range is 2-5 minutes) after which he/she is declared dead and organ procurement starts immediately.

Clause (1) of the RUDDA is based on the assumption that permanent cessation of circulation for 2-5 minutes serves as a surrogate for the loss of brain function including consciousness. But the evidence for this is lacking since clinical assessment for BD/DNC and electroencephalogram (EEG) monitoring are not performed on DCD donors prior to the declaration of death. As Bernat pointed out in 1998, “it takes considerably longer than a few minutes for the brain and other organs to be destroyed from cessation of circulation and lack of oxygen. Moreover, it takes longer than this [observation] time for the cessation of heartbeat [, circulation] and breathing to be unequivocally irreversible, a prerequisite for death. ... The brief absence of heartbeat and breathing is highly predictive of death in this context [of DCD] but at the time the organs are being procured ... death has not yet occurred.” Furthermore, recent studies have also demonstrated surges of EEG activity at the time of death, occurring when there was no discernable blood pressure.

In summary, the use of “permanent” instead of “irreversible” in a statute on the determination of death would *de facto* render the law the handmaid of organ donation-transplantation.

II. Why “irreversible cessation of *all* functions of the entire brain, including the brain stem” cannot be replaced by “permanent (A) coma, (B) cessation of spontaneous respiratory functions, and (C) loss of brainstem reflexes”

1. The rationale undergirding the definition of BD/DNC used in the United States is the whole brain death (WBD) standard, according to which BD/DNC is biological death because the brain is the master integrator of the body, such that its complete and irreversible non-function would cause the death of the human organism. This is why clause (2) of the current UDDA explicitly stipulates

“irreversible cessation of *all* functions of the entire brain, including the brain stem” for the diagnosis of BD/DNC.

Setting aside the controversial issue of whether WBD is the same biological state as traditional circulatory death, a fundamental question must still be addressed: do the three features (“coma, cessation of spontaneous respiratory functions, and loss of brainstem reflexes”) listed in clause (2) of the RUDDA fulfill the aforementioned requirement “*all* functions...” of WBD?

The answer to this question is “No.” In particular, the RUDDA omits the loss of hypothalamic-pituitary function despite the fact that the hypothalamus and the (posterior) pituitary are part of the brain. The hypothalamus-pituitary complex plays a critical role in the maintenance of life, being involved in multiple vital functions including fluid-electrolyte balance, blood pressure control, energy metabolism, temperature control, growth and sexual development, reproductive functions, stress responses, circadian rhythm, and wakefulness, among others. A tell-tale sign of the loss hypothalamic-pituitary function is massive output of dilute urine. Based on the WBD standard, this sign should be present in all brain-dead patients. Yet, it has been found that half of patients diagnosed as brain dead (on the basis of coma, loss of spontaneous breathing confirmed by the apnea test, and loss of brainstem reflexes) still manifest intact hypothalamic-pituitary function.

In summary, that clause (2) of the RUDDA omits hypothalamic-pituitary function and therefore does not meet the WBD standard carries serious consequences: significant numbers of severely brain-injured patients will be declared brain dead even when they are not; among these are those who will undergo organ donation.

2. The formulation of clause (2) of the RUDDA corresponds to the brain stem death (BSD) standard, i.e., “irreversible apneic unconsciousness,” used in the United Kingdom and some Commonwealth countries. Unlike WBD, BSD is not claimed to be biological death. The British admit that BSD is a moral determination of death based on a particular view about what constitutes the essential characteristics of a human person. BSD is a personhood-based determination of death.

3. In neurology, the term “coma” in clause (2) of the RUDDA specifically means a state of sleep-like, unarousable unresponsiveness; it is often used inappropriately as a stand-in for loss of the capacity for consciousness. However, consciousness *per se* means awareness, a private, first-person, subjective experience. Awareness and wakefulness (arousal, responsiveness) do not always go together. In particular, patients with persistent vegetative state (PVS) demonstrate arousal but lack awareness. In the condition known as cognitive motor dissociation in the acute phase of brain injury, patients are aware (i.e., inwardly conscious) yet unresponsive as they are unable to behaviorally express preserved cognitive processes. The case of Zack Dunlap in 2007 illustrates the dissociation between awareness and wakefulness while in a deeply comatose state.

Since neurological examination of comatose patients can only assess responsiveness but not awareness, unresponsiveness does not guarantee unconsciousness and therefore, cannot be equated with it. Reports of late recoveries from PVS and cognitive motor dissociation states further confirm that we currently have no means to detect awareness in order to diagnose loss of consciousness with certainty. Patients diagnosed as brain dead may still be inwardly conscious. In other words, “permanent coma” is not as reliable a diagnostic feature as one may think for BD/DNC.

In conclusion, given that its criteria for the determination of death lack firm scientific grounds, will the RUDDA serve public health, especially when, besides benefiting organ donation, it will also cause living persons to be labeled legally dead?

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