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Death: irreversible or permanent?

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Summary

The most recent guidelines for determining brain death restrict diagnostic criteria to the demonstration of a "permanent" loss of either brain or cardiopulmonary function. This approach departs from the conventional understanding of "death", which is defined by "irreversibility" rather than mere "permanence". Current guidelines in Canada, the USA and the UK, as well as a draft guideline from Switzerland, do not provide convincing justification for this conceptual shift. By adopting permanence as the operative standard, these guidelines risk undermining the dead donor rule, which requires that organ retrieval occur only after death has been definitively established.

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Introduction and historical background

In recent years, guidelines for determining "brain death" have undergone a notable shift. The guidelines of Canada, the United States (US) and the United Kingdom (UK) no longer require *irreversible* loss of brain function to determine "brain death", instead adopting merely a "permanent" loss of function [1-3]. Similarly, the Swiss Academy of Medical Sciences plans to amend its guideline [4]. The current term "irreversible" is to be replaced with "permanent" [5], even though Article 9 of the Swiss Transplantation Act states that a person is dead when brain functions have "irreversibly" ceased. This raises the question of whether a "permanent" standard of organ failure is sufficient for determining death.

This terminological change originates in the concept of "non-heart-beating donation" (NHBD), essentially a return to the earliest practice of organ procurement. Before the concept of "brain death", most organs were retrieved from patients after cardiac arrest [6]. The term commonly used today for this method of organ procurement is "donation after circulatory death".

In the donation after circulatory death procedure, death is declared after a predefined waiting period following cardiac arrest, intended to ensure that circulation has permanently ceased. This interval reflects the maximum time during which autoresuscitation may occur and is typically set at 5 minutes in countries with established donation after circulatory death programmes [7]. Regardless of the specific legal framework, however, any determination of death must remain consistent with the general understanding of death. This becomes questionable when only "permanent" loss of function is required.

The general meaning of "death"

Reliable determination of death requires more than identifying a loss of organ function. Rather, it requires that the *patient* is *dead*. This presupposes a specific understanding and a clear definition of "death". Depending on the definition used, specific, observable changes (criteria or signs of death) must be identified and demonstrated using appropriate diagnostic tests and procedures (diagnostic methods). A coherent concept of death therefore comprises at least three levels: the definition of death, the criterion of death and the tests used to determine death [8] (see table 1, left column). These levels build on each other and are logically ordered: tests (level 3) must demonstrate the criterion of death (level 2), which in turn must fulfil the underlying definition of death (level 1).

Table 1: Death and irreversibility.

Components of a concept of death	General meaning	Irreversibility
1. Definition of death	"Cessation of life"(death as the opposite of life)	Death is irreversible. Humans cannot return to life after death.
2. Criterion or sign of death	Loss of function (e.g. loss of cardiopulmonary or brain function)	The loss of function must be irreversible.
3. Tests for determining death	Tests to determine the relevant functional or organ failure from level 2	Proof of loss of function/organ failure according to level 2 and of its irreversibility.

Given this structure, the definition of death (level 1) determines both the criteria and the diagnostic procedures for determining death (levels 2 and 3). The secular understanding of the term "death" and its use in everyday language imply that people cannot return to life after death [8-10]. Precise definitions of death may remain controversial. Yet across all perspectives – medical, biological, social, legal and cultural – irreversibility is a common denominator. Death, as the "cessation of life", is final and irreversible. Consequently, only an irreversible state can serve as a valid criterion for death and the tests for determining death must demonstrate irreversible loss of function (see table 1, right column).

The difference between "irreversible" and "permanent"

Irreversible loss of function is present when a function will neither return spontaneously nor be restored by any available intervention [8-10]. By contrast, the abovementioned guidelines define *permanent* loss of function as one that will not return spontaneously, given a prior decision not to attempt restoration of that function [1-3, 5]. With regard to circulatory function, this state is typically assumed after approximately 5 minutes. In patients without resuscitation attempts, autoresuscitation has been observed only within a period of 4 minutes and 20 seconds after cardiac arrest [11]. However, if resuscitation efforts were initiated and then discontinued due to lack of success, autoresuscitation may still occur for up to 20 minutes [12] and cardiac activity can be re-established even later with medical intervention. Accordingly, irreversible loss of cardiac function can only be assumed after prolonged attempts to restart circulation for at least 30 minutes.

After only 5 minutes of cardiac arrest, the brain is not irreversibly damaged. It is traditionally assumed that irreversible brain damage occurs approximately 8 to 10 minutes after blood circulation stops [13, 14], with the brainstem being much more tolerant to ischaemia than the cortex [15]. However, a large study on survival after out-of-hospital cardiac arrest found survivors with a favourable neurological outcome even in cases where 30 minutes had elapsed between cardiac arrest and the start of CPR [16].

At 5 minutes of cardiac arrest, there is no evidence of irreversible loss of function in either the heart or the brain. Therefore, the permanent standard fails to meet the necessary condition for reliably determining death. Death is *irreversible* and cannot be reversed. *Permanent* loss of function, as specified in the aforementioned guidelines, cannot be recognised as a valid sign of death.

Justification of "permanent"

The UK Code of Practice states that the term "permanent" was adopted because it "better aligns with clinical reality for most confirmations of death" [3]. This appears to be the only explicit justification in the literature for departing from the standard of irreversibility. The underlying argument is that, in the traditional determination of death based on circulatory arrest, it was not customary to wait until irreversibility had been established [10]. Instead, it was considered sufficient to determine that cardiac activity would not resume and that no attempt would be made to restore it.

However, this practice was justifiable only prior to the 1950s, when cardiac arrest could not be reversed by intervention. The last heartbeat marked a state that would *inevitably* lead to the irreversible state of death. While declaring a patient "dead" immediately after cardiac arrest was not entirely accurate, it was inconsequential as organ procurement was not contemplated. By the time funeral or autopsy procedures took place, irreversibility had undoubtedly occurred.

With the advent of cardiopulmonary resuscitation techniques and positive-pressure ventilation in medical practice, it became clear that pronouncing a patient dead immediately at the moment of cardiac arrest was incorrect. When such declarations were nevertheless made, they represented a *prognosis* rather than a *diagnosis* of death [9]. A prognosis of imminent death is not equivalent to its determination.

Whether a given approach to determining death is consistent with previous or common practice is not decisive. A valid determination of death must conform to the general understanding of death and its undisputed characteristics, especially its irreversibility. Therefore, diagnostic tests must demonstrate an irreversible condition. This requirement is not met by the new "permanent" standard. Notably, some proponents of this approach even concede that patients who are subject to the "permanent" standard are not actually dead, stating "that the cessation of circulation is not irreversible at that point. When this situation is viewed from a strict biological perspective, critics are correct that the donor is not dead at that moment" [10].

Conclusion

The distinction between "permanent" and "irreversible" is substantial. A *permanent* loss of cardiac or brain function does not suffice to establish death. This has direct implications for all individuals considering organ donation, for whom it is essential to know whether their condition at the time of organ removal meets the standard of irreversibility of death. At the very least, transparent communication about the meaning of the amended guidelines in Canada, the US and the UK is required. The Swiss Academy of Medical Sciences should adhere to the current irreversibility standard [4] when revising its guidelines.

Notes

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References

1. Shemie SD, Wilson LC, Hornby L, Basmaji J, Baker AJ, Bensimon CM, et al. A brain-based definition of death and criteria for its determination after arrest of circulation or neurologic function in Canada: a 2023 clinical practice guideline. Canadian Journal of Anesthesia/Journal canadien d'anesthésie. 2023 Apr;70(4):483-557. doi:10.1007/s12630-023-02431-4
2. Greer DM, Kirschen MP, Lewis A, Gronseth GS, Rae-Grant A, Ashwal S, et al. Pediatric and Adult Brain Death/Death by Neurologic Criteria Consensus Guideline. Neurology. 2023 Dec 12;101(24):1112-1132. doi:10.1212/WNL.0000000000207740
3. Academy of Medical Royal Colleges. A code of Practice for the diagnosis and confirmation of death: 2025 Update [Internet]. 2025. Available from: https://www.aomrc.org.uk/wp-content/uploads/2025/01/Code_of_Practice_Diagnosis_of_Death_010125.pdf
4. Swiss Academy of Medical Sciences (SAMS). Medical-ethical guidelines: Determination of death with regard to organ transplantation and preparations for organ removal. Swiss Medical Weekly. 2018 Oct 22;148(4344):w14524. doi:10.4414/smw.2018.14524
5. Schweizerische Akademie der Medizinischen Wissenschaften. Richtlinienentwurf für die öffentliche Vernehmlassung (Medizin-ethische Richtlinien: Feststellung des Todes und vorbereitende medizinische Massnahmen im Hinblick auf eine Organspende) [Internet]. 2025. Available from: https://www.samw.ch/de/Ethik/Themen-A-bis-Z/Organtransplantation/Postmortale-Organspende.html
6. Machado C. The Concept of Brain Death Did Not Evolve to Benefit Organ Transplants. In: Brain Death. Springer New York; 2007. p. 1-20. doi:10.1007/978-0-387-38977-6_1
7. Lomero M, Gardiner D, Coll E, Haase-Kromwijk B, Procaccio F, Immer F, et al. Donation after circulatory death today: an updated overview of the European landscape. Transplant International. 2020 Jan;33(1):76-88. doi:10.1111/tri.13506
8. Beckmann RJ. A structured analysis of the concept of brain death. Theoretical Medicine and Bioethics. 2026 Jun;47(3):231-258. doi:10.1007/s11017-026-09748-3
9. Joffe AR. Should the Criterion for Brain Death Require Irreversible or Permanent Cessation of Function? Irreversible. Neurology. 2023 Jul 25;101(4):181-183. doi:10.1212/WNL.0000000000207403
10. Bernat JL. On Noncongruence between the Concept and Determination of Death. Hastings Center Report. 2013 Nov;43(6):25-33. doi:10.1002/hast.231 Available from: https://www.jstor.org/stable/23597741
11. Dhanani S, Hornby L, van Beinum A, Scales NB, Hogue M, Baker A, et al. Resumption of Cardiac Activity after Withdrawal of Life-Sustaining Measures. New England Journal of Medicine. 2021 Jan 28;384(4):345-352. doi:10.1056/NEJMoa2022713
12. Mavrovounis G, Kontou M, Tsiotsikas O, Mermiri M, Tsolaki V, Beltsios E, et al. From flatline to lifeline: A scoping review of the Lazarus phenomenon. The American Journal of Emergency Medicine. 2023 Oct;72:44-57. doi:10.1016/j.ajem.2023.07.017
13. Hossmann KA, Sato K. Recovery of Neuronal Function after Prolonged Cerebral Ischemia. Science. 1970 Apr 17;168(3929):375-376. doi:10.1126/science.168.3929.375
14. Schneider M. Überlebens- und Wiederbelebungszeit von Gehirn, Herz, Leber, Niere nach Ischaemie und Anoxie. Köln: VS Verlag für Sozialwissenschaften; 1965. doi:10.1007/978-3-663-07358-1

15. Brisson CD, Hsieh Y, Kim D, Jin AY, Andrew RD. Brainstem Neurons Survive the Identical Ischemic Stress That Kills Higher Neurons: Insight to the Persistent Vegetative State. PLoS ONE. 2014 May 6;9(5):e96585. doi:10.1371/journal.pone.0096585

16. Hara M, Hayashi K, Hikoso S, Sakata Y, Kitamura T. Different Impacts of Time From Collapse to First Cardiopulmonary Resuscitation on Outcomes After Witnessed Out-of-Hospital Cardiac Arrest in Adults. Circulation: Cardiovascular Quality and Outcomes. 2015 May;8(3):277-284. doi:10.1161/circoutcomes.115.001864