Critical Care

PERSPECTIVE

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# Death determination at the bedside: clinical judgement beyond criteria

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## Abstract

**Background** In clinical practice, death determination—a core responsibility of critical care clinicians—is commonly taught as the technical application of standardized medical and legal criteria. However, contemporary practices, including resuscitation, death determination by neurological criteria, withdrawal of life-sustaining treatment, and controlled donation after circulatory determination of death, show that determining death also requires interpretative and performative, context-dependent clinical judgement operating within persistent scientific limits and implicit assumptions about human life and its end.

**Main body** Using a single illustrative clinical scenario followed across four trajectories—obvious death, cardiac arrest and resuscitation, death determined by neurological criteria, and circulatory death following withdrawal of life-sustaining treatment—we examine how death determination operates at the intersection of medical criteria, clinical judgement, scientific limits, and implicit assumptions. Particular uncertainties concern the relationships between circulation, cerebral perfusion, and brain function; the distinction between complete and partial loss of brain function; the distinction between permanent and irreversible loss; and the prediction of neurological recovery, acceptable functional outcome, and meaningful life. These uncertainties are managed differently across clinical contexts. Across these contexts, clinicians do not simply observe a discrete biological event: they interpret an evolving process of dying within established medical and legal frameworks. The declaration of death is therefore also performative, transforming the patient's medical, legal, and social status.

**Conclusion** Death determination should not be understood or taught solely as the application of criteria and protocols. Making explicit in critical care education the scientific limits, implicit assumptions, and context-dependent clinical judgement involved in determining and declaring death may help clinicians better assume this responsibility, improve communication with families, and sustain public trust in end-of-life care and organ donation.

**Keywords** Death determination, Brain death, Death by neurologic criteria, Circulatory death, Critical care, Organ donation, Normothermic regional perfusion, Clinical judgement

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## Background

Before becoming an ICU physician, Sophia believed death was self-evident: when the heart stopped beating, life ended. Years of practice in prehospital emergency medicine and intensive care taught her otherwise. Although determining death is an ancient human and social practice, evolving technologies of resuscitation, intensive care, and organ preservation continue to reshape how death is identified and declared in clinical practice. At the bedside, the precise moment of death rarely appears as a single, clear-cut physiological event that can be directly observed. Rather, after the fact, clinicians determine that the patient has entered the condition of being dead through a series of clinical judgements shaped by medical and legal criteria, professional guidelines, institutional contexts, and social norms, as well as clinicians' own training, experience and intentions.

This complexity is reflected in everyday clinical practice. Across settings, substantial gaps persist between clinicians' actual knowledge, and their practices in death determination. In brain death determination, persistent difficulties concern not only the application of diagnostic criteria, but also the underlying question of why the complete and permanent loss of brain function is considered equivalent to human death [1–4]. In death determined by circulatory criteria—one of the most common forms of death in medicine—clinical practices often remain poorly standardized and are frequently learned informally [5–7]. Recent developments in intensive care, including controlled donation after circulatory death and post-mortem organ preservation techniques, have further exposed tensions surrounding how death is determined in practice [8–10].

This Perspective draws on a purposive, non-systematic selection of the literature, informed by the authors' complementary clinical, ethical, and epistemological expertise. Contemporary international guidelines propose a unified framework that defines death as the complete and permanent loss of brain function, whether occurring through neurological or circulatory sequences [11, 12]. For the purposes of this article, we adopt this definition as a working basis because it informs contemporary clinical guidance and practice. However, it does not necessarily correspond to the medical or legal definitions applicable across jurisdictions, including the United States and remains the subject of ongoing academic controversy. We do not address these broader definitional debates here [13], and our use of this framework is therefore not an indication of our endorsement.

Current medical education approaches death determination primarily as a technical and medico-legal process centred on the application of criteria and protocols. We argue that this framework remains incomplete. Death is usually considered a discrete and dichotomous event, whereas, actually, it occurs within a continuous end-of-life process of dying, far from being uniform and unambiguous. Therefore, clinicians do not merely observe a biological event but must interpret an evolving process of dying within medical and legal frameworks, and under uncertainty. Through declaration, within the applicable medical and legal framework, this interpretation becomes performative: it transforms a living patient into a dead person in the eyes of medicine, society, and the law, thereby engaging their responsibility.

This article has an explicitly educational purpose. Rather than proposing alternative definitions of death, we aim to clarify dimensions of practice that often remain implicit in medical training and clinical discourse. Through a hypothetical teaching scenario —not a real or composite patient case— followed across four trajectories, we examine how death determination operates at the intersection of physiology, interpretation, performativity, scientific limits, and implicit assumptions. The four alternative trajectories of this hypothetical scenario are summarized in Fig. 1.

Table 1 summarizes an influential brain-based framework proposed in international medical guidance, according to which death is the complete and permanent loss of brain function, whether occurring through neurological or circulatory sequences [11, 12]. This framework represents a specific conceptual choice and has no uniform medical or legal authority, as current definitions and practices vary across jurisdictions. It also remains subject to ongoing conceptual and academic debate, whether people consider the permanent loss of consciousness itself to be equivalent to death, or, on the contrary, believe that death cannot be determined if the heart is still beating.

## Death determination across four clinical trajectories

### The clinical scenario

Alex is found unconscious, pulseless, and apnoeic. Circulation has ceased and cerebral perfusion has stopped. Physiologically, the situation appears straightforward. Yet one question remains unresolved: is Alex already dead—requiring only declaration—or does he remain potentially recoverable through resuscitation? This single clinical situation serves as the starting point for several trajectories.

### Obvious death: when criteria and judgement remain invisible

In some circumstances, cardiac arrest coincides with obvious death. When Alex is found, his body is cold, stiff, and discoloured—clearly a corpse. No resuscitation is attempted. Irreversible death appears self-evident and requires no deliberation. The exact time of death is unknown, but it has no clinical relevance.

## Out-of-hospital: OBVIOUS DEATH

**Criteria**
None needed
**Clinical Judgment**
Recognition only
**Scientific limits**
Not salient
**Implicit assumptions** Not salient



## In the ICU: BRAIN DEATH

**Criteria**
Neurological
**Clinical Judgment**
Standardized application of criteria
**Scientific limits**
Reliance on proxy measures; inter-jurisdictional variability
**Implicit assumptions**
Equivalence between brain function loss and death

## Out-of-hospital: CARDIAC ARREST

**Criteria**
Circulatory; informed by neurological prognosis
**Clinical Judgment**
Decision to continue or stop resuscitation (operationalizing permanence)
**Scientific limits**
Uncertain thresholds (complete vs. incomplete, permanent vs. irreversible)
**Implicit assumptions**
Sufficient neurological recovery, acceptable functional outcome, meaningful life



## In the ICU: CONTROLLED DCD

**Criteria**
Circulatory, no touch period, and neurological
**Clinical Judgment**
Permanence within a framework
**Scientific limits**
Robustness of safeguards, Uncertain threshold (circulation vs. function, permanent vs. irreversible)
**Implicit assumptions**
No possible return to a state compatible with meaningful life

**Fig. 1** Dimensions of death determination across clinical contexts. Authors' conceptual synthesis

Sophia's clinical judgement adds little to what is already empirically apparent. Yet the declaration remains decisive. Even here, death declaration remains necessary. Through medical declaration, clinicians transform an empirical reality into a legal and social status, allowing subsequent procedures to begin. Death determination is therefore not merely descriptive but performative. In this trajectory, scientific limits and implicit assumptions are minimally salient, and death appears clinically unambiguous.

### Cardiac arrest and resuscitation: permanence as a clinical decision

In many situations, cardiac arrest does not immediately lead to death. Alex collapses in the street and bystanders initiate cardiopulmonary resuscitation. When Sophia arrives, she decides to continue resuscitation because she

**Table 1** Key concepts in death determination according to recent guidelines

| | |
|---|---|
| Medical definition of death | Death is defined as the complete and permanent loss of brain function, whether following a neurological or circulatory sequence [11, 12] |
| Complete vs partial loss | Death determination requires the loss of all brain functions, distinguishing it from states with residual or partial activity |
| Permanent vs irreversible loss | Permanent loss refers to function that will not resume spontaneously and will not be restored through intervention, whereas irreversible refers to function that cannot be restored by any available means [15]. For example, a patient in circulatory arrest for whom resuscitation is not initiated or is discontinued may have permanently, but not yet necessarily irreversibly, lost brain function |
| Event vs process | Death is considered a discrete event, even though it occurs within a continuous process of dying |
| Dichotomous status | A person is considered either alive or dead; there are no intermediate states of "partial death." |

judges that brain function may not be completely nor irreversibly lost.

This judgement operates within major scientific limits. Brain function cannot be directly observed during cardiac arrest, and clinicians cannot identify a precise threshold separating incomplete from complete loss of brain function, or permanent from irreversible loss. Even when circulation is restored, neurological recovery remains uncertain. Sophia therefore relies on clinical context, timing, probabilities and experience rather than certainty.

Her decision also reflects implicit assumptions. Continuing resuscitation presupposes that restoring circulation may allow sufficient neurological recovery toward a meaningful life with acceptable functional outcome, often involving consciousness, relational capacity, and social existence. Yet, at this stage, the patient's own values remain largely unknown, so these judgements primarily reflect clinician's professional and social representations. As long as resuscitation continues, Alex remains legally alive. Clinically, however, he occupies a liminal situation in which his biological status remains epistemically uncertain. After reassessment, Sophia decides not to continue resuscitation because she judges that further restoration of circulation would not achieve sufficient neurological recovery or acceptable functional outcome.

Permanence refers to the cessation of a function that will not resume spontaneously and will not be restored through intervention, whereas irreversibility refers to a function that cannot be restored by any available means [14, 15]. When resuscitation is stopped, death is subsequently declared. Here, permanence—the decision not to restore circulation— becomes the operative criterion rather than irreversibility—a limit imposed by physiology.

This trajectory illustrates how death determination relies on clinical judgment operating within scientific limits and implicit assumptions. Clinical judgment bridges what science cannot fully establish and what practice must nevertheless decide.

### Circulation restored, brain function lost: death by diagnosis

In this third scenario, spontaneous circulation returns just as Sophia is preparing to stop resuscitation. Alex is admitted to intensive care. Despite ongoing life support, no neurological recovery occurs. Two days later, he is declared dead according to neurological criteria—commonly referred to as brain death [16]. His heart continues to beat, his chest rises with mechanical ventilation, and his skin remains warm. To families and untrained observers, little may appear to have changed. Yet he is now medically and legally dead. Brain death is not self-evident and may be deeply counterintuitive.

In practice, brain death determination relies on rigorous neurological examination, sometimes supplemented by ancillary testing. Although definitions, criteria and testing protocols vary across jurisdictions, they generally aim to establish a legally and medically accepted loss of brain function [17]. However, the relevant neurological threshold, its correspondence with applicable legal definitions, and the adequacy of standard testing remain contested.

Yet important scientific limits persist even within this highly standardized framework. Brain function cannot be directly observed. Neurological examination evaluates clinically accessible function, while ancillary tests rely on indirect indicators such as absent cerebral perfusion or electrical activity. These tools strengthen diagnostic confidence but remain proxy measures, illustrated by persistent variability across and within countries [17].

Sophia's clinical judgement, i.e., her interpretation of the situation, operates within a medical framework that equates the complete and permanent loss of brain function with death itself—that is, the end of human life. This equivalence is widely accepted, medically and legally, yet it rests on implicit assumptions concerning which functions are considered essential to human life. Some physiological processes may persist after neurological criteria are met—including continued hormonal activity, pubertal development, or even gestation. Preserved hypothalamic function raises a specific difficulty because it may appear inconsistent with definitions requiring the complete loss of all brain function, although the relevance of neuroendocrine activity to death determination remains debated [18, 19]. Brain death is therefore not defined solely by global physiological collapse, but by a judgment that brain functions—particularly functions supporting consciousness, interaction, and engagement with the

surrounding world—are considered essential to human life [3]. However, this view is not universally shared across philosophical and cultural frameworks. Medical standards and legal definitions vary across jurisdictions and may not fully coincide. Within the applicable medical and legal framework, Sophia's declaration is performative transforming Alex's status from living patient to dead person and making post-mortem organ donation possible from a heart-beating body.

#### Circulatory death after withdrawal of life-sustaining treatment: death within a decided trajectory of care

In this final scenario, Alex does not progress toward brain death but remains profoundly neurologically impaired. Despite persistent uncertainty, partly reflecting the limits of current scientific knowledge, the intensive care team judges that the probability of sufficient neurological recovery, acceptable functional outcome and meaningful life is extremely low. Following collegial discussion and taking into account Alex's advance directives and relatives' views, a decision is made to withdraw life-sustaining treatments [20]. This decision already relies on interpretation and implicit assumptions: that continued treatment would not lead to a life Alex would have considered meaningful, based not only on clinicians' representations but also on the patient's own values [21].

Alex may subsequently become eligible for controlled donation after circulatory determination of death (cDCDD).

In cDCDD, procedural requirements become highly explicit because death determination carries immediate consequences for organ preservation. Continuous monitoring of circulatory arrest and a predefined no-touch period —whose duration varies across jurisdictions—are used to establish permanence by excluding autoresuscitation before death is determined by circulatory criteria. In this framework, circulatory arrest is used as a predictor of the permanent loss of all brain function rather than as a formal neurological determination of death. Restoration of extracerebral circulation during normothermic regional perfusion (NRP) does not necessarily invalidate death determination, provided that cerebral circulation remains excluded; however, the legal and normative acceptance of this interpretation varies across jurisdictions. Following death declaration, NRP—an extracorporeal circulation—is initiated to restore blood flow to selected organs (kidney, liver, heart) to improve graft viability while technical safeguards are implemented to prevent any cerebral reperfusion and thereby maintain the permanence of death [8, 9, 22].

Yet this sequence challenges both components of the dead donor rule. First, the restoration of circulation during NRP introduces a risk—however controlled—of cerebral reperfusion through technical failure or collateral circulation, potentially calling into question whether the donor is unequivocally dead at the time of procurement. Second, the active implementation of safeguards to prevent cerebral perfusion, and thereby ensure the permanence of death during restored circulation, may blur the distinction between allowing death to occur and actively contributing to its maintenance, raising questions about whether the procedure itself participates in the dying process [10]. Conversely, proponents of NRP argue that, when appropriately implemented, technical safeguards excluding cerebral perfusion preserve the permanence of death [8, 22]. Its acceptance nevertheless varies across jurisdictions, and NRP is not currently practiced in some countries because of legal concerns regarding the restoration of circulation. The ethical significance of NRP therefore remains actively debated.

If Alex had previously expressed opposition to donation, however, death would be declared after circulatory arrest according to ordinary practice. In many settings, this process remains relatively informal: circulatory arrest is observed, neurological function is assessed clinically, and death is declared, without the same procedural emphasis on standardized no-touch periods or the explicit exclusion of autoresuscitation. Although circulatory and neurological criteria are already implicitly articulated in this context, the precise relationship between permanence, irreversibility, and brain function often remains unaddressed in routine practice because the exact timing of death carries fewer immediate clinical consequences. Controlled donation after circulatory determination of death and NRP therefore do not create entirely new tensions surrounding death determination; rather, they render tensions already present in routine end-of-life care more explicit and more visible.

Sophia again exercises clinical judgement under uncertainty. Scientific limits persist regarding the relationships between peripheral circulation, cerebral perfusion, and brain function, as well as the capacity of safeguards to fully exclude cerebral reperfusion. Her judgement also relies on the assumptions that no partial cerebral reperfusion at this stage could restore a meaningful life compatible with the patient's prior values. Despite persistent uncertainties, Sophia considers the sequence coherent within a shared professional framework oriented toward the patient's best interests [23].

## From criteria to trust: rethinking death determination in clinical education and practice

Society entrusts clinicians with the responsibility not only to determine, but also to declare death. Shared medical and legal criteria and protocols are indispensable to this responsibility. Yet, as these clinical trajectories illustrate, clinicians do not identify a single observable biological moment of death but interpret an evolving process

of dying within scientific limits and implicit assumptions about what constitutes human life and its end. Through declaration, this interpretation becomes performative, transforming a living patient into a dead person with major consequences for families, end-of-life care, and organ donation.

Current medical education approaches death determination primarily through a biomedical and medico-legal lens centred on criteria and protocols. This framework remains necessary but incomplete. Recognizing the interpretative and performative dimensions of death determination does not make practice arbitrary; rather, it acknowledges that medicine routinely operates through clinical judgement under uncertainty. Judgements about meaningful life and acceptable neurological recovery do not themselves determine whether a patient is dead. They shape decisions about whether resuscitation or life-sustaining treatment should be initiated, continued, or withdrawn. At a more fundamental level, however, definitions of death depend on conceptual and normative judgements about which functions are considered constitutive of human life.

Integrating these dimensions more explicitly into medical training may serve two complementary goals. First, it may help clinicians better understand and assume the responsibility involved in determining and declaring death, strengthening their intellectual and moral security in situations that frequently involve uncertainty, emotional intensity, and ethical tension. Second, it may improve communication with families by moving beyond purely technical explanations toward a more transparent articulation between information and relationship.

Importantly, making these dimensions explicit does not mean transferring unresolved conceptual uncertainty directly onto families or abandoning clinical responsibility. Clinicians remain responsible for determining and declaring death within established professional and legal frameworks. Rather, greater awareness of these dimensions may allow clinicians to communicate more honestly and reflexively about what medicine knows, what it cannot fully know, how decisions are made in practice, and why these decisions nevertheless remain medically, ethically, and socially justified.

Trust therefore depends neither on paternalistic concealment nor on exhaustive technical transparency alone. It depends on clinicians' ability to combine clarity, consistency, and relational presence when accompanying families through the determination and declaration of death.

## Conclusions

Death determination should not be taught solely as the application of criteria. It should also be understood as an interpretative and performative clinical practice requiring judgement, reflexivity, responsibility, and communication. Making these dimensions explicit does not make death determination arbitrary or weaken established medical and legal standards. Rather, it clarifies how clinicians apply those standards in situations where physiology, prognosis, values, and decisions about treatment intersect.

For critical care, this broader account has practical relevance. Education and professional guidance should help clinicians understand not only which criteria to apply, but also the scientific limits and implicit assumptions within which death is determined and declared. Such an approach may strengthen professional confidence, improve communication with families, and sustain public trust in end-of-life care and organ donation.

**Abbreviations**

| | |
|---|---|
| cDCDD | Controlled donation after circulatory determination of death |
| DNC | Death by neurological criteria |
| NRP | Normothermic regional perfusion |
| WLST | Withdrawal of life-sustaining treatment |

**Acknowledgements**

The authors thank Elie Azoulay, Régis Aubry, Sadek Beloucif, Dale Gardiner, David Rodríguez-Arias and Stuart Youngner for their valuable feedback on earlier versions of the manuscript. We also thank the members of the ALIVE research consortium – Approaching Life and Interdisciplinary Views on End-of-Life: Abdelhadi Bellachhab, Michel Castra, Stéphane Charpier, Jean-Baptiste Chevallier, Frédérique Claudot, Vincent Degos, Frank Ferrari, Mikhaël Giabicani, Fabrice Gzil, Robin Michalon, Vianney Mourman, Frédéric Pugnière-Saavedra, Benjamin Rohaut, Laurence Tessier, and Benjamin Zuber. We also thank Damien Coquet for his assistance in preparing the illustration. During manuscript preparation, the authors used ChatGPT (OpenAI) for language editing, structural suggestions, and formatting assistance.

**Author contributions**

MLD conceived the initial idea and drafted the manuscript. ANR, SC, MM and AMP contributed to the conceptual development of the argument and critically revised the manuscript for important intellectual content. All authors read and approved the final manuscript.

**Funding**

We consider it appropriate to declare the funding of the ALIVE research consortium through the AOR SHS programme of the Agence de labiomédecine.

**Data availability**

No datasets were generated or analysed during the current study.

## Declarations

**Ethics approval and consent to participate**

Not applicable.

**Consent for publication**

Not applicable. The clinical scenario described in this Perspective is illustrative and does not represent an individual patient.

**Competing interests**

The authors declare that they have no competing interests.

Received: 15 July 2026 / Accepted: 10 August 2026
Published online: 28 August 2026

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