January 2025

Academy of Medical Royal Colleges

A Code of Practice for the diagnosis and confirmation of death

2025 Update

Contents

Foreword

We welcome the publication of this updated Code which provides clear guidance on the clinical aspects of the diagnosis of death across the United Kingdom (UK) and in all settings including in the community, care homes, hospital wards and intensive care units.

The diagnosis and confirmation of death are core skills for doctors and other clinical staff across the UK. While it is usually relatively straightforward, significant advances in medical practice and technologies mean there are instances that can present specific challenges.

Building on the 2008 Academy Code, this Code includes a number of important updates and incorporates global medical consensus and lessons learned from individual clinical cases internationally. This Code provides updates to specific clinical criteria, including for infants and children under 2-years-old. It also gives advice and guidance to healthcare professionals on communication in the period around when the diagnosis and confirmation of death occurs.

The updated Code is a useful and important resource for all healthcare and wider professionals involved in the diagnosis and confirmation of death.

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Acknowledgements

We are grateful to those who took the time to respond to the stakeholder engagement exercise or who spoke with members of the working groups throughout the development of the 2025 Code.

We are particularly grateful to the lay members of the working groups who have given their time so generously.

Academy statement

This 2025 update of the Code of Practice (the Code) has been approved by the Academy of Medical Royal Colleges (the Academy) as a statement of current practice for the diagnosis and confirmation of death in the United Kingdom (UK).

Although the members of the Academy are predominantly medical professionals, the act of diagnosing and confirming death is not confined to the medical profession. In Scotland, it is a legal requirement that the diagnosis and confirmation of death of a person in whom organ or tissue donation is considered must be undertaken by a doctor. However, in all other circumstances of suspected death, in all four nations of the UK, there is no legal requirement that a doctor be involved, and the confirmation of death can be, and frequently is, undertaken by a wide range of individuals. These individuals are most commonly other healthcare professionals, including nurses, paramedics and other pre-hospital clinical responders. In some circumstances non-healthcare professionals, such as police officers, might undertake the diagnosis and confirmation of death.

Therefore, a range of individuals, many of whom are not doctors, may diagnose and confirm death in the UK. For this reason the Academy recognises and is supportive of the creation and promulgation of profession-specific guidance based upon the Code.

The purpose of the Code is to provide authoritative diagnostic criteria for any individual confirming death in the UK or the clinical foundation for writing profession-specific guidance. This will ensure that all deaths are diagnosed and confirmed in an accurate, standardised and timely manner.

The Code does not (and could not) seek to be a comprehensive statement of clinical and/or legal obligations leading up to and following the death of a person. Nor does the Code seek to specify, outside of death using neurological criteria (which remains a responsibility of doctors), who might be considered competent to diagnose and confirm death. The training and approval of individuals to be competent to diagnose and confirm death, and any restriction to the limits of such competency, remains the responsibility of professional organisations and relevant employers. If the individual diagnosing and confirming death has any concerns about their competency to do so or has any concerns about the interpretation of the Code or whether it should be followed in any clinical situation, they should discuss the matter with professional colleagues or seek advice from their employer.

1. Introduction

For centuries there has been a social and professional responsibility on doctors and other healthcare professionals to diagnose and confirm death. In the modern era the Academy and its predecessor organisation, The Conference of Medical Royal Colleges and their Faculties, have issued authoritative statements and Codes of practice on how to diagnose and confirm death in the UK.[1-5]

While death itself has not changed since the last Academy Code was published in 2008 (the 2008 Code),[5] medical practice and technologies have advanced, particularly in the fields of resuscitation, intensive care, neurosurgery and organ donation. These factors led to the need to provide updated guidance for all those involved in the diagnosis and confirmation of death. A summary of changes from the 2008 Code is provided in **Appendix 1**.

Included in this, the 2025 Academy Code (the Code), is an update **[Appendix 2]** by the Royal College of Paediatrics and Child Health (RCPCH) to their 2015 recommendations for the *diagnosis of death by neurological criteria in infants less than two months old*,[6] and the 1991 report for children older than two months, *Diagnosis of brain-stem death in infants and children: a working party report of the British Paediatric Association*.[7] The purpose of including Appendix 2 is to return to the 2008 Code position in which all ages were incorporated within the same document. The update from the RCPCH includes specific guidance for the diagnosis and confirmation of death using neurological criteria in children of all ages, with special reference to infants aged 37-weeks corrected gestation (post menstrual) to aged 2-years corrected post term. From 2-years of age, children should undergo clinical assessment for the diagnosis and confirmation of death using neurological criteria, using the same criteria applicable to adults. There are, however, some subtle and important aspects to ancillary investigation depending on the age of the child that differ from adults.

In updating the Code, we deliberately sought to incorporate, where possible, the growing world-wide medical consensus in diagnosing death. Many statements are intentionally similar to international documents in the interests of commonality of approach. In particular the update was informed by the 2020 work of the World Brain Death Project,[8] the 2021 Australian and New Zealand Intensive Care Society's *Statement on Death and Organ Donation*,[9] the multiple evidence-based publications in the 2023 Canadian Journal of Anesthesia *Special Issue: Defining and Determining Death in Canada*,[10,11] and the 2023 *Pediatric and Adult Brain Death/Death by Neurologic Criteria Consensus Guideline* from the American Academy of Neurology and the American Academy of Pediatrics.[12] The Code also incorporates lessons learnt from individual clinical cases in both adult and paediatric practice in the UK and internationally.

Considering the diagnosis and confirmation of death

The diagnosis and confirmation of death has important implications for the person who has died, their family and friends, healthcare professionals and society. The consequences can include:

- The cessation of medical interventions designed to sustain or re-establish life.
- The commencement of after-death rituals, customs, grieving and mourning.
- The transfer of the person who has died to a mortuary, funeral home or another approved location.
- The care and preparation of the person who has died for funeral, burial or cremation.
- Where required, post-mortem examination.
- In some circumstances, organ and tissue donation.
- A change in the legal status of the person who has died and a change in the legal status of other family members (for example in relation to property ownership).

In nearly all circumstances death is a process rather than an event, with different organs, tissues and cells ceasing function and beginning decay at different rates. It is therefore necessary to define a point in this process where death can be diagnosed and confirmed in an accurate, standardised and timely manner.

The UK is a religiously and culturally diverse country. We respectfully acknowledge the many different beliefs in our society and across the world regarding the concept of death and death practices.

In the UK a biomedical definition of death, based on loss of function in the brainstem, has been medically accepted since 1979.[2] Although there is no statutory definition of death in the UK, the courts have recognised the concept of brainstem death as legal death, most notably the House of Lords in 1993,[13] and the Court of Appeal in 2020 and 2023.[14,15] Additionally, the courts have repeatedly and explicitly accepted the Academy's Codes (and its predecessors) as providing the authoritative criteria for brainstem death. To date, the case law has been in England and Northern Ireland but there is no reason to think that a different approach would be taken elsewhere in the UK.

The Code continues to support this long-accepted UK consensus.

An outline of the Code

Death occurs at all ages and in many settings, including hospitals, care homes, individual residences, workplaces and public spaces. The primary purpose of the Code is to outline the criteria by which death can be diagnosed and confirmed in an accurate, standardised and timely manner, whatever the circumstance in which the death has occurred.

Section 2 of the Code defines the point at which death can be diagnosed and confirmed.

Section 3 introduces the three sets of diagnostic criteria which can be used to confirm death and the clinical circumstances where a particular set of criteria would be most appropriate to use. The three sets of criteria are then outlined in detail.

Somatic criteria **[Section 4]** are appropriate to use when death follows overwhelming physical trauma or when death is suspected to have occurred a considerable time before. These criteria can be used by healthcare professionals or other competent individuals.

Circulatory criteria **[Section 5]** are appropriate to use when death follows cardiorespiratory arrest and is the most common way death is diagnosed and confirmed. These criteria should, ordinarily, only be used by healthcare professionals.

Neurological criteria **[Section 6]** are appropriate to use when death follows a devastating brain injury but where the circulation is being maintained by ongoing mechanical ventilation and other intensive care interventions. Approximately 1,500 patients each year in the UK have their death diagnosed and confirmed using neurological criteria. These criteria should only be used by doctors.

While the Code is written in language primarily directed at those responsible for the diagnosis and confirmation of death, we hope that it is also accessible to members of the public who seek understanding of how death is diagnosed and confirmed. A particular ambition has been to better support communication between healthcare professionals and the public, and that is reflected by the inclusion of a new communication section **[Section 7]**. We are grateful to the lay contribution we received in writing this section and input into the rest of the Code.

As described above, In **Appendix 1** there is a summary of changes and updates from the 2008 Code. While in **Appendix 2**, the Royal College of Paediatrics and Child Health *2025 update on the diagnosis of death using neurological criteria in infants, children, and adolescents* is given.

A note on terminology

In the UK, the individual most likely to diagnose and confirm death is a healthcare professional. For this reason, we most frequently refer to the person who has died as a patient, unless we are discussing wider concepts or considering communication with family and friends, where person is used.

In the Code we continue to use the terminology of 'diagnosis and confirmation of death' from the 2008 Code.[5] We do not use any of the alternative terms sometimes found in use (e.g. pronounced life extinct (PLE), determination of death, verification of death (VoD)). We hope that over time greater consistency in terminology across the different professions will occur.

'Diagnosis' in medicine is the process by which doctors and other healthcare professionals determine the identity of a disease, condition or clinical state. In the Code we describe the process required to diagnose death. This process involves satisfying pre-specified diagnostic criteria in the history and examination and, where required by the criteria, carrying out any additional tests or investigations. The inclusion of the term 'confirmation' highlights the fact that the healthcare professional is working to establish the truth or correctness of something suspected to be the case. The Code therefore provides, in detail, the diagnostic criteria by which a competent individual can seek to confirm if the suspicion that death has occurred, based upon the clinical signs, is correct.

In practice the term 'diagnosis' is more often used among healthcare professionals as a way of explaining their intention and actions, whereas the term 'confirm' can be particularly useful when discussing a person's death with family and friends.

In the Code we have adopted the use of the term 'permanent' rather than 'irreversible' when describing the loss of functions that need to have occurred to diagnose and confirm death. For example, the 'permanent' cessation of brainstem function. Irreversible was the term used in this context in the 1998 and 2008 Codes but not in the original 1976 Code, where permanent was used. While there is some academic debate about which is the better of the two terms, we consider that referring to 'permanent loss of function' provides greater clarity, consistency and simplicity, and better aligns with clinical reality for most confirmations of death. Additionally, it helps bring the UK to the same position as an increasing number of other countries that have moved to using the term permanent in their guidelines for the diagnosis and confirmation of death.[9,11,12]

2. The definition of death

2.1 While, biologically, death is a process, it is necessary to define a point in the process where death can be diagnosed and confirmed in an accurate, standardised and timely manner.

2.2 Death entails the loss of those essential characteristics which are necessary to the existence of a living human person. The definition of death should therefore be regarded as the permanent loss of the capacity for consciousness, combined with permanent loss of the capacity to breathe.

2.3 The permanent cessation of brainstem function, whether as a consequence of cardiorespiratory arrest or devastating brain injury, will produce the permanent loss of the capacities for consciousness and for breathing, and thus, the clinical state of death. Therefore, a diagnosis of permanent cessation of brainstem function means the person has died and allows a competent individual to confirm the person's death.

2.4 Certainty that cessation of brainstem function is permanent is assured by satisfying the relevant criteria to diagnose and confirm death as outlined in the Code.

2.5 Death is confirmed at the time when a competent individual is satisfied the relevant criteria to diagnose and confirm death are met.

2.6 At the time that death is confirmed, not all neurological or other bodily functions and cellular activity may have ceased. The criteria in the Code establish that the persistence of any of these functions or cellular activity is not indicative of any form of consciousness associated with human life, such as: arousal, wakefulness, and the ability to feel, to be aware of, or to have subjective experience.

3. The diagnostic criteria for the confirmation of death

3.1 There is only one definition of death but three sets of diagnostic criteria. Each set of criteria satisfies the definition of death as outlined in **Section 2**. The three sets of criteria for the diagnosis and confirmation of death described in the Code are: somatic, circulatory and neurological. Professional judgement and clinical circumstances will guide which criteria are the most appropriate to use.

Somatic criteria are used following overwhelming physical trauma or when death is suspected to have occurred a considerable time before **[Section 4]**.

Circulatory criteria are used following cardiorespiratory arrest, most commonly in a care or community setting when death is expected, but also in cases of sudden and unexpected cardiorespiratory arrest where resuscitation has been unsuccessful **[Section 5]**.

Neurological criteria are used following devastating brain injury in patients on an intensive care unit who remain deeply comatose, have absent brainstem reflexes and are apnoeic with their lungs being mechanically ventilated but in whom circulation and other bodily functions persist **[Section 6]**.

3.2 *Before using any of the diagnostic criteria*, the competent individual diagnosing and confirming death must be satisfied there are no further appropriate therapeutic options which could benefit the patient.

3.3 When correctly applied and satisfied, each set of criteria definitively confirms death, that is, the permanent loss of the capacity for consciousness combined with permanent loss of the capacity to breathe **[2.2]** due to permanent cessation of brainstem function **(2.3)**.

3.4 The criteria are applicable to all age groups, except where additional specific criteria or guidance are given in the Code **[Appendix 2]**.

Who can use the diagnostic criteria for the confirmation of death?

3.5 No statute regulates who can diagnose and confirm death. The only exception is in Scotland, where for the specific purpose of deceased organ and tissue donation, it must be a registered medical practitioner.[16]

3.6 In recognition of this fact, we refer in our definition to 'competent individuals' **[2.3, 2.5]**. The diagnosis and confirmation of death is distinct from medical certification of cause of death where there is a legal requirement that this is the sole responsibility of doctors.

3.7 We recommend that the diagnostic criteria as outlined in the Code should be regarded as authoritative guidance for anyone confirming death in the UK or writing profession-specific guidance. This will ensure that all deaths are diagnosed and confirmed in an accurate, standardised and timely manner.

3.8 The Code does not seek to specify, outside of death using neurological criteria **[Section 6]** (which remains the responsibility of doctors) who might be considered competent to diagnose and confirm death. The training and approval of individuals to be competent to diagnose and confirm death, and any restriction to the limits of such competency, remains the responsibility of professional organisations and relevant employers. Further details on who can use the three respective diagnostic criteria to confirm death is found elsewhere in the Code **[4.6, 5.7, 6.6]**.

3.9 Irrespective of the professional status of the individual, or the criteria being used to diagnose and confirm death, the following principles apply:

- The individual undertaking the diagnosis and confirmation of death should be competent to do so. If they do not consider themselves competent, they should request that another individual takes on the responsibility.
- *If there is uncertainty about the occurrence of death, resuscitative measures should be commenced*, unless there is a valid and documented 'do not attempt cardiopulmonary resuscitation (DNACPR)' recommendation, advance decision or equivalent.
- The process should be undertaken in a respectful, accurate, standardised, and timely manner.
- Employing organisations must ensure that all individuals that they employ, who may be expected in the course of their usual duties to diagnose and confirm death, are trained and competent to do so.

- For regulated professionals, all regulators and relevant professional organisations should ensure that the diagnosis and confirmation of death are competencies included in relevant training curricula.
- Where appropriate, standardised documentation should be provided by employing organisations or professional organisations to ensure that the criteria used to diagnose and confirm death align with the Code.

3.10 Most confirmations of death will be made by healthcare professionals. For ease of readability in the Code we generally refer to 'healthcare professionals' diagnosing and confirming death unless there is a specific need to highlight other competent individuals who may be confirming death **[Section 4]**.

4. Somatic criteria

4.1 Somatic criteria for human death are ancient and include such findings as rigor mortis, decapitation and decomposition. When correctly applied, somatic criteria unequivocally diagnose death, confirming the permanent loss of the capacity for consciousness combined with permanent loss of the capacity to breathe **[2.2]**.

4.2 Somatic criteria are appropriate to use following overwhelming physical trauma or when death is suspected to have occurred a considerable time before.

4.3 When death is confirmed using somatic criteria there is no requirement to attempt cardiopulmonary resuscitation (CPR) or diagnose death using circulatory or neurological criteria.

4.4 If there is diagnostic uncertainty regarding somatic criteria, the absence of a central pulse, breathing and pupillary constriction to light should be used as supplementary criteria. If any doubt remains, the need to attempt CPR must be considered and death should only be subsequently diagnosed using circulatory criteria **[Section 5]**.

4.5 Somatic criteria are particularly important in forensic, midwifery, the ambulance services and other community medical, nursing and emergency services. The Association of Ambulance Chief Executives (AACE) and Joint Royal Colleges Ambulance Liaison Committee (JRCALC) provide guidance for paramedics and other relevant healthcare professionals entitled *'Conditions unequivocally associated with death.'*[17] The presence of the signs associated with these conditions, and the consequent diagnosis and confirmation of death, provide reassurance to healthcare professionals and families that CPR will not be effective and should not be attempted.

Who can use somatic criteria?

4.6 The diagnosis of death using somatic criteria should be undertaken by an appropriately trained and competent individual, who is physically present with the person being diagnosed deceased. This can include, but is not limited to, doctors, registered nurses, advanced practitioners, and paramedics and other pre-hospital clinical responders; and may include non-healthcare professionals.

4.7 Employing organisations, regulators and professional organisations must provide the necessary training to ensure every diagnosis and confirmation of death using somatic criteria is carried out in accordance with the Code and thereby in an accurate, standardised and timely manner **[3.9]**.

Preconditions for the application of somatic criteria

4.8 Before using somatic criteria, the competent individual confirming death must be satisfied there are no further appropriate therapeutic options which could benefit the patient **[3.2]**. These options include CPR and, as at **4.4**, if there is any doubt, the need to attempt resuscitation must be considered.

Process for the application of somatic criteria

Clinical examination

4.9 **Table 1** outlines a list of somatic criteria and associated observable signs which are diagnostic of death.

Time of death

4.10 Death is confirmed at the time when a competent individual is satisfied the relevant somatic criteria to diagnose and confirm death are met **[2.5]**.

4.11 For some purposes (e.g. forensics), the time of death might be assigned to the point death is thought to have occurred, rather than when the death was diagnosed and confirmed by a competent individual.

Table 1. Somatic criteria *

Criteria	Explanation	Additional notes
Overwhelming physical trauma		
a. Decapitation	The separation of the head from the body.	Incomplete decapitation which separates the spinal column and major vessels from the head but leaves some tissue connected is equally diagnostic for death.
b. Massive cranial and cerebral destruction	Massive injury to the skull (cranial) vault and brain tissue.	Additionally, there must be no signs of life.
c. Hemicorporectomy or similar massive injury	Traumatic hemicorporectomy is separation of the body at the waist.	While hemicorporectomy has, on occasion, been surgically performed as an extreme and very rare lifesaving procedure, where the hemicorporectomy is traumatic in origin, and where there is no history of a prior surgical procedure or any signs of life, the finding is diagnostic of death.
d. Incineration	"The presence of full-thickness burns with charring of greater than 95% of the body surface."	Additionally, there must be no signs of life.
Time based signs		
e. Post-mortem hypostasis / livor mortis	"The pooling of blood in congested vessels in the dependent part of the body in the position in which it lies after death."	Hypostasis should not be used as the only criterion to confirm death. If there is any diagnostic uncertainty the need to attempt CPR must be considered **[4.4]**.
f. Rigor mortis	"The stiffness occurring after death from the post-mortem breakdown of enzymes in the muscle fibres."	Rigor mortis commences earlier in warm environments but in some people, rigidity may never develop (e.g. infants, cachectic individuals and older people).

* Adapted from The Association of Ambulance Chief Executives (AACE) and Joint Royal Colleges Ambulance Liaison Committee (JRCALC) 'Conditions unequivocally associated with death.' [17] Where we use exact wording it is put in quotations marks.

Table 1. Somatic criteria * (cont.)

Criterion	Explanation	Additional notes
Time based signs		
f. Rigor mortis (cont.)	"Rigor mortis typically occurs first in the small muscles of the face, next in the arms, then in the legs, with these changes taking between 30 minutes and 3 hours and lasting up to 36 hours." The changes of rigor mortis are generalised and not localised to any one muscle group. Rigor mortis and hypostasis are often present concomitantly.	The following conditions should not be confused with rigor mortis: I. "Trismus (spasm of the muscles around the jaw which may occur in those with a reduced level of consciousness)." II. Heat stiffening (e.g. following electrocution or exposure to high temperature). Cold stiffening (e.g. following exposure to sub-zero temperatures). III. Cadaveric spasm (sometimes referred to as instant rigor mortis, which can develop immediately after death in voluntary muscle groups that were in a state of contraction at the time of death). Cadaveric spasm does not necessarily disappear with time. If there is any diagnostic uncertainty the need to attempt CPR must be considered **[4.4]**.
g. Decomposition/putrefaction	"Where tissue damage indicates that the patient has been dead for some hours, days or longer."	These processes commence earlier in warm environments and later in cold ones.
h. Foetal maceration in a newborn	Autolytic changes which follow in-utero death.	Care should be taken in a stillborn child that died more than a day before birth as skin loosening may result in sloughing off when touched.

* Adapted from The Association of Ambulance Chief Executives (AACE) and Joint Royal Colleges Ambulance Liaison Committee (JRCALC) 'Conditions unequivocally associated with death.' [17] Where we use exact wording it is put in quotations marks.

5. Circulatory criteria

5.1 Death after cardiorespiratory arrest has long been identified by the concurrent and permanent absence of breathing (apnoea), circulation and responsiveness.

5.2 Circulatory criteria are the most common criteria used for the diagnosis and confirmation of death. When correctly applied, circulatory criteria unequivocally diagnose death, confirming the permanent loss of the capacity for consciousness combined with permanent loss of the capacity to breathe **[2.2]**.

5.3 When death is confirmed using circulatory criteria there is no requirement to attempt resuscitation or diagnose death using somatic or neurological criteria.

5.4 Circulatory criteria are used when death is suspected to have occured following a period of cardiorespiratory arrest. Before diagnosing and confirming death using circulatory criteria, there must be a decision not to attempt or continue resuscitation. This is typically because the cardiorespiratory arrest is expected and follows a prior decision not to attempt resuscitation, as frequently occurs in community, hospital or other care settings, thus permitting a natural death to occur. Circulatory criteria are also applied in circumstances where resuscitation was attempted but was unsuccessful.

5.5 Without circulation to the brain the capacity for consciousness is lost very rapidly, typically within 30 seconds,[18] and is often lost prior to the cardiorespiratory arrest in hypoxaemic states.[19]

5.6 Permanent cessation of brainstem function can be safely diagnosed after 5 minutes of continuous absence of the circulation, allowing death to be confirmed **[2.4]**. This is because at 5 minutes the possibility of spontaneous resumption of cardiac function (autoresuscitation) will have passed.[20]

Following the diagnosis and confirmation of death using circulatory criteria no intervention must be made which has the potential to restore brainstem function.

Who can use circulatory criteria?

5.7 The diagnosis of death using circulatory criteria should be undertaken by an appropriately trained and competent individual, ordinarily a healthcare professional, who is physically present with the patient being diagnosed deceased. This can include, but is not limited to, doctors, registered nurses, advanced practitioners, and paramedics. Endorsed, profession-specific guidance is provided for registered nurses for use in expected adult deaths.[21]

Those diagnosing and confirming death should not be acting on behalf of the organ retrieval and transplant service at that time and must not be involved in the allocation of any of the patient's organs or tissues that may subsequently be donated for transplantation.

5.8 The knowledge and skills required to use circulatory criteria builds upon that already gained during education and training to become a registered healthcare professional, particularly the need to be competent in the use of a stethoscope **[5.13]**.

Healthcare and professional organisations must provide any additional training and support necessary to ensure that every diagnosis and confirmation of death using circulatory criteria is carried out in accordance with the Code and thereby in an accurate, standardised and timely manner **[3.9]**.

Preconditions for the application of circulatory criteria

Each of the following preconditions must be met before circulatory criteria can be applied.

5.9 Death has not been confirmed using somatic criteria **[Section 4]** or neurological criteria **[Section 6]**.

5.10 The patient appears to be unconscious and in cardiorespiratory arrest.

5.11 Before using circulatory criteria to diagnose and confirm death the healthcare professional must be satisfied there are no further appropriate therapeutic options which would benefit the patient.

5.12 One of the following must be fulfilled:

a. A decision has been made not to commence resuscitation. Ordinarily this is because there is a valid and documented 'DNACPR' recommendation, ReSPECT form, advance decision or equivalent.

b. Attempts at resuscitation have been made but have not been successful and resuscitation has stopped. Before stopping resuscitation, healthcare

professionals must carefully consider relevant national resuscitation guidance and the possibility of reversing any contributing cause to the cardiorespiratory arrest.

If there is any doubt, the need to attempt or continue CPR must be considered.

Process for the application of circulatory criteria

Clinical examination

5.13 The patient must be *assessed* by the healthcare professional diagnosing death for a *minimum of 5 minutes*.

The healthcare professional should observe and examine for:

a. continuous unconsciousness

b. continuous absence of breathing (apnoea), as indicated by the absence of visible chest movements and audible breath sounds on auscultation with a stethoscope

c. continuous absence of circulation, as indicated by absence of a central pulse on palpation and by absence of heart sounds on auscultation with a stethoscope.

There is no requirement that the healthcare professional palpate for a central pulse or auscultate for breath and heart sounds over the entire 5 minutes. However, the healthcare professional must be physically present and observing the patient for the full 5 minutes and be satisfied their examination is sufficient.

After 5 minutes the possibility of spontaneous resumption of circulatory function will have passed.[20]

If the patient was receiving mechanical or artificial ventilation this should be stopped and the patient disconnected from the ventilator to remove any residual PEEP (positive end expiratory pressure) before the 5 minute observation period can be started.

5.14 In some clinical settings the above methods can be supplemented during the 5 minutes by one or more of the following:

— absence of cardiac electrical activity as indicated by electrical asystole ('flat line') on a continuous electrocardiogram (ECG) display

— absence of cardiac contraction using echocardiography

— absence of pulsatile arterial pressure on an appropriately scaled, continuous intra-arterial pressure monitoring trace.

These supplemental methods can support a timely diagnosis and confirmation of death which follows soon after cardiorespiratory arrest. This may be helpful for families and healthcare professionals following the cessation of CPR or death occurring in a patient in a highly monitored environment such as an intensive care or emergency setting. It is also important in some types of organ donation (e.g. donation after circulatory death).

The 5 minute assessment period commences with the onset of circulatory arrest (mechanical asystole) and apnoea. Echocardiography and direct intra-arterial pressure monitoring can detect circulatory arrest more rapidly than ECG. Electrical asystole therefore is not required if echocardiography or intra-arterial pressure monitoring can be used.

5.15 Following the 5 minutes of assessment **[5.13]** the absence of the pupillary responses to light and the absence of any motor response to supraorbital pressure should be confirmed. When death is being diagnosed and confirmed soon after cardiorespiratory arrest, we recommend that the neurological examination be supplemented by confirming the absence of corneal reflexes.

5.16 Any spontaneous return of circulatory, respiratory or neurological function should be followed by a further 5 minutes assessment from the next point of cardiorespiratory arrest.

Time of death

5.17 Death is confirmed at the time when the healthcare professional is satisfied all the relevant circulatory criteria to diagnose and confirm death are met **[2.5]**.

5.18 The confirmation of death should occur in a timely manner and as soon as is practicable, bearing in mind the potential implications of delay for family and others. Families should be advised that there might be a difference between the time of the last observed breath and the documented time of death **[Section 7]**.

Special circumstances

5.19 Special circumstances may exist following prolonged CPR, extracorporeal membrane oxygenation (ECMO) or other modes of mechanical circulatory support, or some post-mortem procedures during organ donation. Professional organisations such as Resuscitation Council UK, Royal College of Emergency Medicine, ECMO services or the National Health Service (NHS) Blood and Transplant may choose to implement additional safety criteria for the diagnosis and confirmation of death when these special circumstances apply.

5.20 Some modern organ donation retrieval procedures involve the restoration of the circulation in part of the body after death. If these procedures are used, protocols must ensure there is no blood circulation to the brain.

Remote diagnosis and confirmation of death

5.21 During the COVID-19 pandemic guidance was provided to allow the 'remote' diagnosis of death.[22] We strongly recommend that the diagnosis and confirmation of death should never be undertaken 'remotely' except in such similarly extraordinary circumstances, and with relevant authorised guidance in place. The physical presence of a trained and competent individual ensures consistency and accuracy of diagnosis, protects the safety and dignity of the patient and the wellbeing of any family members or friends who may otherwise have been asked to assist in confirming death of someone known to them.

6. Neurological criteria

6.1 In patients with devastating brain injury, the first objective for healthcare professionals is to establish the cause and depth of coma, to maintain life while this is being done (respecting any valid advance decision to limit treatment) and to attempt to restore brain function.

However, when the injury results in permanent cessation of brainstem function, a state beyond coma, even if circulation and other organ functions can be artificially maintained successfully, death of the person has occurred.

6.2 Neurological criteria are used when death is suspected to have occurred in patients following a devastating brain injury who remain deeply comatose (Glasgow Coma Scale score 3), have no observed brainstem reflexes and are apnoeic with their lungs being mechanically ventilated, but in whom circulation and other bodily functions persist.

Typically, the patient will be on an intensive care unit. In these circumstances death cannot be diagnosed using circulatory criteria because mechanical ventilation (or more rarely, ECMO), maintains oxygenation and prevents circulatory arrest.

6.3 When correctly applied, neurological criteria unequivocally diagnose death, confirming the permanent loss of the capacity for consciousness combined with permanent loss of the capacity to breathe **[2.2]**. Certainty that the cessation of brainstem function is permanent **[2.4]** is assured by satisfying the criteria below.

6.4 When death is confirmed using neurological criteria there is no requirement to attempt resuscitation or diagnose death using circulatory criteria.

6.5 Establishing whether a patient is dead or alive is of benefit because:

a. If death is diagnosed, continued mechanical ventilation and other intensive care interventions can be ceased.
b. If death is not diagnosed, decisions regarding ongoing care can be made.

While continued mechanical ventilation and other intensive care interventions may maintain (some) organ function in the body after death, they are inappropriate beyond a short interval that may be justified as part of end of life and bereavement care.

Who can use neurological criteria?

6.6 The confirmation of death using neurological criteria is a clinical diagnosis that should be made by at least two doctors who have had full registration with the General Medical Council (GMC) – or equivalent international professional body recognised by the GMC – for more than 5 years and are competent to diagnose and confirm death using neurological criteria in the UK. At least one of the doctors must be a consultant.

Doctors who diagnose death using neurological criteria as part of their clinical practice have a professional responsibility to ensure that their knowledge and skills in the application of these criteria are up to date. In the UK the diagnosis of death using neurological criteria is predominantly undertaken by intensive care doctors, but it has also been undertaken by anaesthetists, neurosurgeons and neurologists.

Those diagnosing and confirming death should not be acting on behalf of the organ retrieval and transplant service at that time and must not be involved in the allocation of any of the patient's organs or tissues that may subsequently be donated for transplantation.

6.7 The diagnosis of death using neurological criteria should be undertaken by the two doctors working together but each independently ensuring that the diagnosis is carried out in an accurate, standardised and timely manner. The two doctors must be satisfied that all the necessary preconditions for the application of neurological criteria are met or can be mitigated by the addition of an ancillary investigation.

6.8 The two doctors work together to perform a full set of clinical tests. The clinical tests are then repeated and must always be performed on two occasions i.e. a total of two sets of clinical tests (including two apnoea tests) will be performed.

It is acceptable for one or both doctors to be substituted in the second set of clinical tests. In all circumstances the two doctors in each set of clinical tests must satisfy the requirements of **6.6**. As such, a minimum of two doctors, but on occasion up to four doctors, will diagnose death using neurological criteria in any patient.

6.9 Families should receive a careful, compassionate and sensitive explanation of the tests, the implications of the result and the certainty provided. Giving written or visual information to the family may also be helpful.

Families should ideally be offered the opportunity to observe a set of clinical tests when confirming death using neurological criteria. Often, the second set of tests is the most appropriate and useful for families to witness.

An explanation of the possibility for non-brain mediated movements **[6.19]** should always be given.

6.10 Healthcare and professional organisations must provide the necessary training to ensure every diagnosis and confirmation of death using neurological criteria is carried out in accordance with the Code and thereby in an accurate, standardised and timely manner **[3.9]**. This should include training on explaining and communicating neurological criteria to patient families.

6.11 Standardised documentation should be provided by healthcare and professional organisations to ensure that the process to diagnose and confirm death using neurological criteria aligns entirely with the Code **[3.9]**. The documentation should be reviewed and updated regularly. Electronic documentation is acceptable provided it is up-to-date and can be readily shared by all who might require it.

6.12 The use and application of neurological criteria should be kept under continual review and informed by clinical experience of unusual, difficult and challenging cases and the emergence of new therapeutic modalities. Given that neurological criteria are used almost exclusively on adult and paediatric intensive care units, we recommend that the Faculty of Intensive Care Medicine and the RCPCH should ensure that a system for review of such cases is in place, that can disseminate any relevant learning to the clinical community, and as necessary, inform the Academy of any need to update the Code.

Preconditions for the application of neurological criteria

6.13 Specific preconditions must be fulfilled before the two doctors can commence their clinical testing.

The following preconditions listed here are discussed in detail below:

- Aetiology severe enough to cause permanent cessation of brainstem function.
- Assessment period sufficient to exclude the potential for recovery.
- Exclusion of potentially reversible factors materially contributing to the coma or apnoea.
- Additional caution for diagnosing death using neurological criteria in uncommon circumstances.

Aetiology severe enough to cause permanent cessation of brainstem function

6.14 There should be no doubt that the patient's condition is due to devastating brain injury of known aetiology or mechanism.

6.15 Specifically, the diagnosis of death using neurological criteria requires that the patient has an established devastating brain injury, the nature and severity of which is recognised to result in the permanent cessation of brainstem function. This evaluation must include neuroimaging but might also include electrophysiological or invasive intracranial pressure measurements.

6.16 The doctors diagnosing and confirming death must be satisfied that there are no further appropriate therapeutic options which would benefit the patient.

6.17 Neurological criteria do not require the confirmation of anatomical destruction of the brainstem or the cessation of all neurological or other bodily functions. What does follow from a diagnosis of death using neurological criteria is that there is sufficient severity of brain injury that there can be no form of consciousness associated with human life, such as: arousal, wakefulness, and the ability to feel, to be aware of, or to have subjective experience **[2.6]**.

6.18 Patients in a vegetative state/unresponsive wakefulness syndrome are not dead because they have persisting brainstem function, notably some aspects of consciousness (e.g. arousal, wakefulness) and the capacity to breathe. Similarly, babies born with anencephaly usually have some functional brainstem and therefore will not satisfy neurological criteria by the nature of their condition alone.

6.19 After confirming death using neurological criteria, non-brain mediated movements are well recognised and can include spontaneous or stimulated spinal reflexes, automatisms (occasionally of a complex nature) and muscle fasciculations.[23-26] These movements are independent of the brain and are initiated at the spinal cord or at a neuromuscular level. They may appear or persist while mechanical ventilation and other intensive care interventions maintain oxygenated blood to the spinal cord and other parts of the body. The longer somatic support is continued after the diagnosis and confirmation of death using neurological criteria, the more likely non-brain mediated movements will appear and potentially, the more exaggerated the movements might be. Such movements do not, in and of themselves, indicate that there is any form of consciousness associated with human life nor any brainstem function.

Healthcare professionals should always explain the significance of these movements to the patient's family, and where necessary other staff, who should be given sufficient information and explanation to enable them to understand that they do not originate from the brain.

Where there is any clinical doubt to their origin, ancillary investigation may provide assurance that these movements do not originate from the brain.

6.20 On occasion patients in whom the diagnosis of death using neurological criteria is being considered or has been confirmed, appear to be spontaneously breathing while connected to the mechanical ventilator. Care must be taken that this is not an artefact, due to the ventilator auto-cycling/triggering. Temporary disconnection from the mechanical ventilator and placing the patient on a spontaneous breathing circuit (e.g. applying continuous positive airway pressure (CPAP) via a Mapleson C circuit) will identify any true spontaneous breaths. For this reason the apnoea test must not be performed while the patient is connected to a mechanical ventilator **[6.44]**.

Assessment period sufficient to exclude the potential for recovery

6.21 The two doctors must be satisfied that recovery or improvement of the patient's condition will not occur with the passage of time, i.e. there is permanent cessation of brainstem function.

6.22 In some patients with primary intracranial pathology, such as severe traumatic brain injury or spontaneous intracranial haemorrhage, permanent cessation of brainstem function may be suspected very quickly following initial presentation. In all cases, neurological criteria should not be applied until at least 6 hours following the loss of the last observed brainstem reflex or spontaneous breath.

6.23 Return of brainstem function may be delayed in cases of acute hypoxic-ischaemic encephalopathy or post cardiorespiratory arrest. In this circumstance neurological criteria should not be applied until at least 24 hours following the loss of the last observed brainstem reflex or spontaneous breath.

6.24 Hypothermia may delay the return of brainstem function. In patients who are hypothermic (defined as a core temperature less than 36°C), either therapeutic or accidental, neurological criteria should not be applied until at least 24 hours following correction of hypothermia (that is, attaining a core temperature of 36°C or greater). Following correction of hypothermia, transient and temporary reductions in temperature to below 36°C do not mandate a further 24 hour observation at normothermia.

6.25 If there is uncertainty about the potential for recovery the observation time should be extended. If diagnostic uncertainties regarding potential recovery remain, the diagnosis of death using neurological criteria cannot be made.

Exclusion of potentially reversible factors materially contributing to the coma or apnoea

6.26 There are potentially reversible factors which may materially contribute to the coma or apnoea and risk confounding a diagnosis of death using neurological criteria. Doctors applying neurological criteria must carefully exclude all the potentially

reversible factors below and any other factors they consider might be materially contributing to the coma or apnoea. If reversible factors cannot be excluded, the addition of an ancillary investigation will be necessary to support a diagnosis of death using neurological criteria **[6.54]**.

6.27 Hypothermia

The core temperature should be greater than or equal to 36°C at the time of clinical testing. This may require active warming of the patient.

In clinical practice patients may be awake and conscious at temperatures below 36°C. The target of 36°C is to ensure greater consistency with other international standards.[8,11,12]

6.28 Depressant drugs

Patients with devastating brain injury should be considered as having a vulnerable brain which might be more sensitive to lower levels of depressant drugs than would be the case in health. It is essential therefore that the recent history of what drugs have been ingested or administered is carefully reviewed to exclude any possibility of ongoing drug effect being the cause of, or materially contributing to, the patient's coma or apnoea.

Excluding the effects of sedative drugs may be difficult. The length of time between discontinuation of depressant drugs and the application of neurological criteria depends on several factors including total dose and duration of treatment. The action of sedatives and analgesics may persist particularly during prolonged infusions, when hypothermia coexists, or in the presence of renal or hepatic impairment. Similarly, in infants and children, alterations to metabolism and excretion of drugs should be considered. Some sedatives (e.g. the benzodiazepines, thiopentone) and analgesics (e.g. opioids such as morphine and fentanyl) are markedly cumulative and persistent in their actions.

If there is any doubt, the measurement of specific drug levels, where possible, may inform the application of neurological criteria. In other circumstances, residual sedative effects should be predicted according to pharmacokinetic principles in both adults and children. Advice from the UK National Poisons Information Service or pharmacology/biochemistry specialists may be helpful.

Specific antagonists such as naloxone or flumazenil can be used to support the conclusion, and help eradicate doubt, that there is residual drug effect causing the coma or apnoea.

If the effects of depressant drugs cannot be excluded, the addition of an ancillary investigation **[6.54]** will be necessary to diagnose and confirm death using neurological criteria.

6.29 Profound neuromuscular weakness

Profound neuromuscular weakness resembling the absence of brainstem reflexes may occur as a consequence of a number of neuromuscular or metabolic disorders, including critical illness neuromyopathies, or a result of the effect of some drugs.

Specifically:

a. Neuromuscular blocking agents and other drugs must be excluded as contributing to apnoea or neuromuscular weakness.

b. A peripheral nerve stimulator or other recognised method [(e.g. presence of deep-tendon reflexes, electromyography)] should be used to confirm that adequate neuromuscular function is present.

In patients where a pre-existing or acquired neuromuscular disorder is known or possible, careful consideration should be given to the impact of drug history and muscle function before applying neurological criteria.

6.30 Cervical spinal cord pathology

If there are reasons to suspect that underlying high cervical cord pathology, with or without associated cervical spine injury, is contributing to the apnoea, then further investigation, typically with computed tomography (CT) or magnetic resonance imaging (MRI), will be needed. Where imaging demonstrates cervical spinal cord pathology, the apnoea test alone cannot reliably confirm the loss of the capacity to breathe and must be supplemented with an ancillary investigation.

In cervical spinal cord pathology, we recommend that the apnoea test is still performed in the usual way **[6.44]**, unless the injury is of such an extent that spontaneous breathing is considered impossible.

a. If the apnoea test *can* be performed:

   — If the patient breathes during the test, then the diagnosis of death using neurological criteria cannot be made. The patient is not dead.

   — If the patient does not breathe, then the diagnosis of death using neurological criteria can only be made by confirming both the absence of other brainstem reflexes and by the addition of an ancillary investigation **[6.54]**.

b. If the apnoea test *cannot* be performed, then the diagnosis of death using neurological criteria can only be made by confirming both the absence of brainstem reflexes and by the addition of an ancillary investigation **[6.54]**.

6.31 It is recognised that circulatory, electrolyte and metabolic, and endocrine disturbances [e.g. hypotension, hypernatraemia, diabetes insipidus] are likely

accompaniments to both permanent cessation of brainstem function and devastating brain injury. Such disturbances do not preclude the application of neurological criteria. However, if these disturbances cannot be corrected and are judged to be potentially contributing to the cessation of brainstem function, ancillary investigation must be considered.

6.32 Circulatory and respiratory disturbances

Normal (or patient baseline) intensive care physiological parameters should be targeted prior to and during the application of neurological criteria. The doctors undertaking the clinical testing should be satisfied that any cardiovascular or respiratory disturbance is not materially contributing to the observed coma or apnoea.

6.33 Electrolyte and metabolic disturbances

Serum or plasma blood samples can be used as per local availability.

a. *Sodium*

- The sodium level should be between 125 and 160 mmol/L, inclusive.
- The effects of hyponatraemia depend on the rate of its development, but it is rare for patients to become unresponsive if the sodium concentration is greater than 115 mmol/L.
- If severe hyponatraemia is corrected too rapidly the patient may develop osmotic demyelination syndrome, which can cause a potentially reversible coma.
- Sodium levels above 160 mmol/L can be associated with unresponsiveness.

b. *Potassium*

- The potassium level should be greater than 2.0 mmol/L.
- Profoundly low levels of potassium may cause myopathy and levels below 1.0 mmol/L have been reported to cause flaccid quadriplegia.

c. *Phosphate and magnesium*

- The phosphate and magnesium levels should be between 0.5 and 3.0 mmol/L, inclusive.
- Profound elevation or lowering of phosphate or magnesium may be associated with severe neuromuscular weakness that may culminate in flaccid quadriplegia.

d. *Glucose*

- Blood glucose should be between 3.0 and 20.0 mmol/L, inclusive.
- As blood glucose concentrations can change rapidly in critically ill patients, a blood sugar measurement should be made prior to clinical testing.
- Hyperglycaemia in diabetic ketoacidosis or hyperosmolar hyperglycaemic state may cause a state of unresponsiveness and cessation of brainstem function, but this state is extremely unlikely with blood glucose levels less than 20.0 mmol/L.
- Severe hypoglycaemia is associated with coma or stupor and testing of brainstem reflexes should not be undertaken if the glucose level is below 3.0 mmol/L.

e. *Other electrolyte and metabolic disturbances*

Other electrolyte and metabolic disturbances may rarely contribute to the coma or apnoea (e.g. elevated urea or ammonia, metabolic disorders). In such situations either correction, expert metabolic advice, or ancillary investigation should be considered.

6.34 Endocrine disturbances

- The two doctors should be satisfied that there is no clinical reason to suspect that an endocrine disturbance is materially contributing to the coma or apnoea. If there is doubt, appropriate endocrine assays should be undertaken.
- Myxoedema may cause a deep unresponsive coma.
- Patients in thyroid storm may present in acute coma or with acute thyrotoxic myopathy.
- Addisonian crisis may be associated with severe neuromuscular weakness causing an acute ascending paralysis or encephalopathy proceeding to coma.

Additional caution for diagnosing death using neurological criteria in uncommon circumstances

6.35 Aetiology primarily isolated to the posterior fossa or brainstem

Brain injury isolated to the posterior fossa or brainstem is consistent with a diagnosis of death using neurological criteria, provided the permanent cessation of brainstem function can be assured **[2.3]**.

In many cases, patients with an initially isolated posterior fossa lesion will develop supratentorial pathology and standard approaches to neurological criteria would then apply.

In isolated posterior fossa and brainstem pathology without supratentorial involvement we recommend that an MRI is undertaken to more accurately delineate the extent of involvement and damage to the brainstem and other posterior fossa structures before a diagnosis of death using neurological criteria is made. Clinical testing should only be undertaken when there is agreement in the multidisciplinary team that there are no further appropriate therapeutic options which would benefit the patient and that enough time has elapsed to exclude the possibility of neurological recovery.

6.36 Therapeutic decompressive craniectomy and other conditions where intracranial compliance may be significantly increased

The purpose of therapeutic decompressive craniectomy is to allow the brain to swell following devastating brain injury with the intention of minimising structural brain damage from raised intracranial pressure. In the context of a patient who appears to meet neurological criteria following a therapeutic decompressive craniectomy, we recommend that a diagnosis of death using neurological criteria is supported by the addition of an ancillary investigation.

Similarly, there is the theoretical risk that severe skull fractures resulting in loss of cranial bone integrity could behave in a similar manner to therapeutic decompressive craniectomy. In this situation the need for ancillary investigation or expert advice should be considered.

6.37 Patients receiving therapeutic steroids to reduce brain oedema

If corticosteroids are being used therapeutically to reduce brain oedema (e.g. tumour, abscess, meningitis or trauma), we recommend that a diagnosis of death using neurological criteria is supported by the addition of an ancillary investigation.

6.38 Children younger than 2-years of age

Specific, additional caveats to diagnosing and confirming death using neurological criteria in children under 2-years of age (corrected age post term for children born prematurely) are outlined in the 2025 RCPCH update **[Appendix 2]**.

Process for the application of neurological criteria

6.39 The diagnosis of death using neurological criteria is a two-stage process. To diagnose death using neurological criteria, two sets of clinical tests must be undertaken by the doctors. Both sets of clinical tests must confirm the absence of

brainstem function. The clinical tests are only ever performed when there is a strong clinical suspicion that death has occurred and following an extensive consideration of the preconditions as outlined above.

6.40 The clinical tests to exclude brainstem function involve clinical testing of brainstem reflexes and the apnoea test. Together, these comprise one set of clinical tests. The clinical tests are then repeated. Two sets of clinical tests must be performed to diagnose and confirm death using neurological criteria.

In some circumstances ancillary investigation may be required to support the diagnosis **[6.54]**.

6.41 The application of neurological criteria involves the following considerations:

- clinical testing of brainstem reflexes
- the apnoea test
- repetition of the clinical tests
- time of death
- the role of ancillary investigations
- special circumstances.

Clinical testing of brainstem reflexes

6.42 Considerations

During the clinical testing and examination of brainstem reflexes, any evidence of persisting brainstem reflexes means that the diagnosis of death cannot be made.

An adequate stimulus, bilateral where able, which would ordinarily generate a response, should be applied during the clinical testing of the brainstem reflexes.

Given that the eyes are required in the clinical testing of three of the six brainstem reflexes used in neurological criteria, it must be possible to examine both eyes and there should be no reason to suspect an eye injury or abnormality would prevent the reflex occurring if it could. In the case of an inability to examine either eye, for whatever reason, ancillary investigation will be required to support a diagnosis of death using neurological criteria. Similarly, both ears must be able to be accessed for the vestibulo-ocular reflex. The ancillary investigation is in addition to the fullest application of neurological criteria possible in the specific circumstance.

6.43 The specific brainstem reflexes

a. *Pupillary reflex (cranial nerves II, III)*
The pupils are fixed in a midsize or dilated position and are not reactive to light visible to the naked eye, or determined by a pupilometer. Test for direct and consensual response on both sides.

b. *Corneal reflex (cranial nerves V, VII)*
There should be no eyelid movement when each cornea is touched in turn. Touching the sclera is not sufficient. Care should be taken to avoid damage to the cornea. We recommend the use of sterile gauze.

c. *Vestibulo-ocular reflex (cranial nerves III, IV, VI, VIII)*
Clear access to the tympanic membrane must be established by direct inspection prior to the examination. We recommend that if one ear cannot be accessed, for whatever reason, the addition of an ancillary investigation should be considered. A ruptured eardrum does not preclude the test.

Suggested technique
Elevate the head to 30° to the horizontal plane (to place the horizontal semicircular canals in a vertical position, optimising its stimulation),[8] unless this positioning is contraindicated by the presence of an unstable spinal injury. It may be helpful for the second doctor to hold both eyelids open. No eye movements should be seen in either eye during or following the slow injection of at least 50 ml (20-50 ml for a child) of ice-cold water over 1 minute into each external auditory meatus in turn.

This should be performed on both sides. Any eye movement, including tonic deviation or nystagmus, precludes a diagnosis of death using neurological criteria.

d. *Motor response (cranial nerves V, VII)*
There should be no motor response within the cranial nerve or somatic distribution in response to supraorbital pressure. This should be performed on both sides.

Somatic reflex limb and trunk movements (spinal reflexes) may need to be differentiated from genuine brain mediated function **[6.19]**. If there is doubt, ancillary investigation will be required.

e. *Gag reflex (cranial nerves IX, X)*
There should be no gag reflex to stimulation of the posterior pharynx. Use a tongue depressor or firm suction catheter (e.g. Yankauer sucker) to stimulate the posterior pharynx bilaterally. Some doctors may choose to use a laryngoscope or video laryngoscope to assist in obtaining a good view of the pharynx for stimulation.

f. *Cough reflex (cranial nerve X)*
There should be no cough reflex response to tracheal stimulation by a suction catheter placed down the trachea to the carina.

The apnoea test

6.44 Considerations

a. The process for testing the respiratory response to moderate hypercarbia and acidaemia (apnoea test) should be the last brainstem function to be tested and should not be performed if any of the preceding brainstem reflexes are present.

b. The apnoea test must not be performed while the patient is connected to a mechanical ventilator. Cardiac pulsation or other artefacts may be sufficient to trigger mechanical breaths, which may be misinterpreted as patient triggered breaths if the patient remains connected to the ventilator set on a spontaneous breathing mode **[6.20]**.

c. Some patients require a higher arterial partial pressure of carbon dioxide ($PaCO_2$) stimulus to breathe, e.g. chronic carbon dioxide retention, those who have received intravenous bicarbonate. Checking the patient's baseline $PaCO_2$ level, bicarbonate concentration ([HCO_3]) and pH will help identify patients with chronic carbon dioxide retention, either preexisting or acquired during the intensive care admission. In such situations start the apnoea test at a $PaCO_2$ at or above their chronic or typical baseline if known.

6.45 Preparation

— Pre-oxygenate with fraction of inspired oxygen (FiO_2) of 1.0.

— Prepare a CPAP circuit (e.g. Mapleson C or equivalent) for use when the patient is disconnected from mechanical ventilation.

— Some doctors may choose to use end-tidal carbon dioxide ($ETCO_2$) monitoring to help guide when to take the starting arterial $PaCO_2$ and to assist in identifying any respiratory effort following disconnection from mechanical ventilation.

6.46 Technique

a. *Confirm a starting arterial $PaCO_2$ of at least 5.3 kPa*
This ensures that the carbon dioxide stimulus to breathe is normal to supranormal at the start of the apnoea test. This may require adjustment of the minute ventilation on the mechanical ventilator.

Starting the apnoea test at very high $PaCO_2$ levels (e.g. greater than 7.0 kPa) increases the risk of inducing physiological instability.

In patient groups who require a higher $PaCO_2$ stimulus to breathe **[6.44]** start the apnoea test at a $PaCO_2$ at or above their chronic or typical baseline if known.

b. *Observe for a minimum of 5 minutes looking for spontaneous respiratory effort*

The patient is disconnected from the mechanical ventilator and placed onto the CPAP circuit delivering FiO_2 of 1.0. Ensure the CPAP circuit is not over pressured, which would make observation of respiratory effort difficult to identify or risk cardiovascular instability. The period for observing respiratory effort commences from this point.

Oxygenation and cardiovascular stability should be maintained through each apnoea test. If serious instability occurs the apnoea test may have to be aborted **[6.47]**.

There must be no respiratory effort over a *minimum* of 5 minutes following disconnection from the mechanical ventilator.

As the $PaCO_2$ rises there will be an increase in precordial (cardiac) and abdominal (aortic) pulsations. This should not be confused with respiratory effort and may need to be explained to the patient's family. Watching for reservoir bag movement in the CPAP circuit can assist in identifying any respiratory effort. If $ETCO_2$ monitoring is used be mindful that artefacts from cardiac pulsation can be present.

c. *Confirm apnoea test end arterial blood targets have been met*

After a *minimum* of 5 minutes without observed respiratory effort a confirmatory arterial blood gas sample is obtained to ensure that the $PaCO_2$ and pH have reached the apnoea test targets.

Confirm that:

- Arterial $PaCO_2$ is at least 8.0 kPa.
- Arterial $PaCO_2$ has risen by at least 2.7 kPa from the starting $PaCO_2$.
- Arterial pH is less than 7.3 ($[H^+]$ >50 nmol/L).

If the patient is stable, it is usual to wait for the (rapid) return of the arterial blood gas result before reconnecting to the ventilator in case the required apnoea test targets have not been met.

If the apnoea test arterial blood end targets have not been met, further time disconnected from the mechanical ventilator should be allowed, provided the patient maintains cardiovascular stability with acceptable oxygen saturation. The arterial blood gas should then be repeated until the apnoea test targets are reached or the apnoea test aborted **[6.47]**.

The 5 minutes observation is a minimum.
Some doctors may choose to delay taking the confirmatory arterial blood gas sample immediately at 5 minutes to increase the certainty that the $PaCO_2$ and pH have reached the apnoea end arterial targets.

d. *Conclude the apnoea test*
If there has been no observed spontaneous respiratory effort, and the apnoea end test targets have been met, a conclusion of no brainstem respiratory centre function is made.

A recruitment manoeuvre should be carried out before resuming mechanical ventilation.

Mechanical ventilation parameters should be altered to normalise the arterial blood gases between the two clinical tests.

6.47 The apnoea test should be aborted if:

a. respiratory effort is witnessed
b. there is significant cardiovascular instability despite titration of fluids/ inotropes/vasopressors
c. there is significant oxygen desaturation despite the addition of FiO2 of 1.0 and CPAP, or
d. an unstable arrhythmia occurs.

6.48 If the apnoea test targets are not met (start $PaCO_2 \geq 5.3$ kPa, minimum 5 minutes, end $PaCO_2 \geq 8.0$ kPa, rise $PaCO_2 \geq 2.7$ kPa, end pH <7.3) optimising the patient's cardiovascular and respiratory parameters or applying more CPAP during the disconnection, may allow the apnoea test to be reattempted.

In the case of an *absolute inability* to complete the apnoea test, for whatever reason, ancillary investigation will be required to support a diagnosis of death using neurological criteria.[8,9,11,12] The ancillary investigation is in addition to the fullest application of neurological criteria possible in the specific circumstance.

Repetition of the clinical tests

6.49 The clinical tests must always be performed on two occasions. All tests, including the apnoea test, are therefore performed twice in total.

The two doctors, working together, carry out each set of clinical tests. Typically, one doctor will perform the first set of tests while the other observes, with roles reversed for the second set. It is however, acceptable for another doctor to undertake or observe the second set, or for another separate pair of doctors to undertake the second set **[6.8]**.

As such, at least two doctors, and up to four, will be involved in the performance and direct observation of the two sets of clinical tests. In all circumstances the two doctors in each set of tests must satisfy the requirements of **6.6** and be individually willing to document that death has been diagnosed and confirmed using neurological criteria.

6.50 If the first set of clinical tests shows no evidence of brainstem function there need not be a lengthy delay before performing the second set. It is entirely appropriate to use the time between the two tests to inform the patient's family of the result and allow family members to attend the second set of clinical tests, if desired. The patient's arterial blood gases and baseline parameters should be restored to appropriate pre-test level, before commencing the second set of tests.

Time of death

6.51 Death is confirmed using neurological criteria at the time when all doctors involved in carrying out the clinical tests are satisfied all the relevant neurological criteria to diagnose and confirm death are met **[2.5]**.

6.52 This would ordinarily be at the time of completion of the second set of clinical tests. This becomes the recorded time of death.

6.53 When ancillary investigations are required to confirm death, the time of death will be the point at which the final two doctors undertaking the process are satisfied that all the relevant neurological criteria to diagnose and confirm death are met, with the support of ancillary investigations.

The role of ancillary investigations

6.54 The Code provides the principles for the use of ancillary investigations rather than to advise on the specifics of any individual ancillary investigation or protocol.

6.55 The diagnosis of death using neurological criteria is primarily a clinical diagnosis based upon the satisfaction of preconditions and two sets of clinical tests. Ancillary investigations are not routinely required.

6.56 In certain situations, it may not be possible to satisfy all the preconditions or perform or complete all the clinical tests necessary to diagnose death using neurological criteria. In such circumstances, the addition of an ancillary investigation, either before or after clinical testing, is necessary to support a diagnosis of death using neurological criteria.

6.57 All ancillary investigations, including their timing with regard to clinical testing, have different sensitivities and specificities, and their results should be interpreted carefully by the doctors diagnosing death using neurological criteria. No ancillary investigation is a full replacement for the clinical diagnosis based upon the satisfaction of preconditions and two sets of clinical tests.

6.58 We recommend that ancillary investigation is only undertaken when there is strong clinical suspicion that death has occurred.

6.59 Any ancillary investigation should be additional to the fullest examination and clinical testing, carried out to the best of the doctors' capabilities in the given circumstances.

6.60 The evidence base in children is limited and specialist advice should be sought. Ancillary investigation is not recommended in children less than 2-years of age **[Appendix 2, A9]**.

6.61 The ancillary investigation undertaken for any patient depends on any national guidance, local availability of that investigation and access to expertise to interpret the result. No single ancillary investigation has worldwide consensus, though there has been a shift toward ancillary investigations that confirm the absence of cerebral blood flow or cerebral perfusion.[8]

6.62 Electroencephalography (EEG), while still used in some countries, is no longer recommended as an ancillary investigation for neurological criteria in the UK for adults or children.[8,9,11,12] This does not preclude the use of EEG as a diagnostic aid and for detection of potentially treatable conditions, such as non-convulsive seizures.

6.63 The technology for ancillary investigation is rapidly evolving. The Academy considers that healthcare professional organisations, with appropriate expertise, are best placed to maintain up to date national guidance on ancillary investigations.

A UK multidisciplinary consensus guideline for the use of cerebral CT angiography as an ancillary investigation to support a clinical diagnosis of death using neurological criteria in adults has been published.[27,28]

6.64 We recommend that ancillary investigation is required in the following two circumstances (which have also been detailed above):

- When a comprehensive neurological examination, including the apnoea test, is not possible (e.g. high cervical cord pathology, inability to examine both eyes or both ears).

— When continuing effects of confounding factors which affect the preconditions cannot be excluded (e.g. residual sedation, metabolic or pharmacological derangement, decompressive craniectomy).

Clinical judgement will guide the extent to which any ancillary investigation can support a diagnosis of death using neurological criteria.

6.65 Ancillary investigation can be considered when there is uncertainty regarding the interpretation of presumed non-brain mediated movements.

6.66 Sometimes, ancillary investigation may help promote understanding of the clinical confirmation of death using neurological criteria to families who are uncertain of or do not accept a diagnosis based on clinical testing alone. In this situation the doctors are using an ancillary investigation to provide reassurance rather than as a diagnostic aid.

6.67 The reason for an ancillary investigation should always be documented in the patient's record.

Special circumstances

6.68 Patients requiring extracorporeal membrane oxygenation (ECMO)
Patients requiring ECMO and other forms of extracorporeal support, due to either absent or extremely limited respiratory and/or cardiac function, are at high risk of complications leading to devastating brain injury and therefore death.

UK guidance to supplement the 2008 Code for patients on ECMO has been previously published.[29] This guidance identified that ECMO can impact neurological criteria in two main ways. Firstly, pharmacokinetic alterations can occur requiring additional care and consideration and secondly, the apnoea test can be more challenging to perform because the ECMO circuit continues to remove carbon dioxide during both the preparation period and the apnoea test.

The requirements to diagnose death using neurological criteria, as outlined above, are unchanged in patients requiring ECMO. Specifically, the fulfilment of the *preconditions*, the *clinical testing of brainstem reflexes* and the *apnoea test targets* **[6.46]**. These targets remain achievable with the method proposed in the supplementary UK guidance and are in keeping with international guidance.[8,9,11,12] If considered necessary ancillary investigations can also be used to support the diagnosis in patients requiring ECMO.

It is anticipated that the authors of the previous UK guidance, and other relevant organisations, will update the supplementary guidance for diagnosing and confirming death using neurological criteria on ECMO in due course, to ensure full consistency with the Code.

6.69 Managing requests to prevent the application of neurological criteria or to continue somatic support after death has been confirmed

In rare circumstances, the patient's family may, for a variety of reasons, request that:

a. neurological criteria to diagnose and confirm death should not be used, despite the clinical suspicion that the patient has died, or

b. if death has been diagnosed and confirmed using neurological criteria, that somatic support, such as mechanical ventilation and other intensive care treatments, be continued.

Section 7 outlines principles of communication which may be helpful in supporting families, and others who care for the welfare of the person, through the diagnosis and confirmation of death, and preempt such disagreement.

We recommend approaching the patient's family in the usual way that treatment disagreements are managed in intensive care. That is, with respect and compassion, honesty and transparency, listening and seeking to understand, with patience and allowing more time for explanation within the areas of disagreement, and by providing cultural and religious support and second opinions if acceptable to the family. Offering the patient's family the opportunity to see radiological imaging, with appropriate clinical explanation, and to witness the clinical testing of brainstem reflexes and the apnoea test, even repeating the tests for a third time, may also help family acceptance and understanding.

Legal advice should be sought urgently if agreement cannot be reached in a reasonable amount of time and at most within a few days.

7. Communication

Many publications and resources are available which cover the details of communication around the end of life. The duties and responsibilities of doctors and nurses at this time have been clearly defined.[30,31] We therefore do not seek to replicate that detail here but instead provide some guidance on good communication in the period when the diagnosis and confirmation of death occur. 'Diagnosis and confirmation of death' is the terminology used throughout the Code, but the term 'verification of death' is also in common use by the Royal College of Nursing, Hospice UK and others.[21]

This section focuses on the communication between a healthcare professional and a patient's family, though it may have relevance to other situations. It should be noted that 'family' is often used as a practical shorthand for 'family members', 'family and friends', 'next of kin', 'carers' and 'advocates' in the clinical context. However, it is important to remember that the family is not a singular unit, instead it is composed of various individuals with varying knowledge of the patient. For that reason, we use 'family and friends' here. In law the term 'next of kin' has no application for healthcare decision-making. Healthcare professionals should, where practicable, be willing to talk to those who are close to the patient.

The UK is a socially, religiously and culturally diverse country. It is therefore important for all healthcare professionals to be sensitive and ensure that any specific cultural, faith, belief or needs of the person who has died and the bereaved are considered when diagnosing and confirming death (including care of the person after death). Healthcare professionals can and should ask family and friends what practices around the time of death are important to them and the person who has died.

The Code, like its predecessors, has a biomedical definition of death which centres on the concept that death occurs when brainstem function has permanently ceased. We acknowledge that other perspectives exist. At all times, healthcare professionals should strive to identify, acknowledge and understand these perspectives when communicating about any aspect of the diagnosis and confirmation of death with the patient's family and friends. In addition, healthcare professionals should not allow their own feelings and beliefs to influence what or how they communicate with family and friends.

Healthcare and professional organisations, who train and approve individuals as competent to diagnose and confirm death in accordance with the Code, should also train these individuals in communication around the time of death.

Communication around the time of death

The death of any person, at any age, and in any circumstance, is a major event for their family and friends. The place and time of death often holds significance and, as such, the process of diagnosis and confirmation must be carried out in a respectful, as well as accurate, standardised, and timely manner.

Never assume that the age of the patient, the suddenness or otherwise of the death, the cause of death, or the apparent proximity of the relationship between the patient and family and friends will affect them in a consistent or predictable manner.

Healthcare professionals should always be aware of the unpredictable nature of the impact of death on family and friends and strive to communicate in an empathic and sensitive manner.

The death of a loved one may create anxiety, concern, or conflict within a family or between a family and healthcare professionals. Issues relating to events before death, for example, the adequacy or otherwise of prior care, may surface at this time. Healthcare professionals should listen to and acknowledge any concerns, providing information to help families address and resolve them.

Where death is expected

In circumstances where death is imminent and resuscitation is not to be attempted, all efforts should be made in advance to ensure that family and friends understand and are prepared for this and are provided the opportunity to be present at the time of death, should this be possible and desired. Counselling, emotional and spiritual support should be offered as appropriate.

It is often difficult to predict the time until death, even in people with advanced terminal disease. Healthcare professionals should always be prepared to share this uncertainty with family and friends.

Where death is unexpected

The communication of sudden and unexpected death can be particularly stressful to family and friends and to the healthcare professional delivering the sad news. If family and friends are not present at the time of death but arrive afterwards, it is good practice to inform them of the time of death, who was present and the circumstances surrounding the death. It will also be important to inform them of what to expect when they see their loved one. The detail of this will depend on whether the patient is in a hospital or care home bed or has been moved to a mortuary.

Who should communicate the death?

- The person who communicates the death should be the most appropriate healthcare professional available at the time.
- This could be the healthcare professional who diagnosed and confirmed death, or was present at that time, or a healthcare professional who was involved in the care of the patient before they died.
- Where death is expected, the family and friends should be asked to nominate someone who can be contacted first in the event of death.

Where should communication occur?

- A quiet and private place where those receiving the news can react without concern that they are overheard or seen by others.
- A neutral place, without religious symbols or medical illustrations.
- Healthcare professionals should ensure that their phone is silenced, and they will not be interrupted.
- Healthcare professionals should ensure that they will have enough time to communicate the news in an unhurried and sensitive manner.

How should the news be delivered?

- It is always preferable to communicate in person, face to face.
- In some situations, for example, sudden unexpected death, a telephone call may be unavoidable.
- In expected death, prior agreement may have been reached that communication can be by telephone.
- When communicating the death by telephone, it is preferable that the family or friend of the patient who is contacted has someone else with them when the call is received. However, it is often not possible to know if this is the case when the call is made and, if the person is alone, permission should therefore be sought to contact another family member or friend immediately after the call who can provide support as necessary.
- Professional interpreters should be available as appropriate.
- In all situations, including following cardiopulmonary resuscitation, expected death in a terminal care setting or when a patient is receiving ventilatory support in intensive care, the patient's family and friends should be allowed the opportunity

to be present during the process of diagnosing and confirming death. Some families may additionally wish for a faith leader to be present at this time or during subsequent communication.

- Use simple language and avoid medical terminology and jargon.
- Use the words 'death' or 'dead' or 'died' in the conversation and not any other terms where misinterpretation might occur, such as 'passed', 'passed away' or 'lost'.
- Expressions of sympathy from healthcare professionals are natural and appropriate. It is entirely appropriate to use the word 'sorry.' For example, 'I am very sorry that [name] has died.'
- Questions should be anticipated. These commonly relate to the time of death and, particularly if family and friends were not present, who was with the patient when they died. Family and friends should be encouraged to ask questions if they wish.
- It may be important to inform the family and friends that the time that they observed the person to stop breathing may not be the time of death recorded on any formal documentation.
- Healthcare professionals should understand that it is entirely natural for family and friends to show emotion at this time.
- Conversations should include where appropriate, signposting to, for example, bereavement support services, spiritual support and the death certification process, including any post death reviews which may occur e.g. medical examiner scrutiny, HM Coroner/Procurator Fiscal review or inquest.
- Documenting who was present at the time of death and identifying who in the family will lead on any future bereavement paperwork may also be helpful.

When should communication occur?

- If family and friends are present during terminal decline or during the application of neurological criteria, the diagnosis of death should be communicated as soon as the healthcare professional confirms it.
- If family and friends are not present during terminal decline or during the application of neurological criteria, the diagnosis of death should be communicated as soon after confirmation of death as possible.

Further reading and resources

Below is a sample of publications and resources. In no way should this list be considered extensive or definitive, but is offered to provide an avenue for those interested in exploring further.

De Leo D, Congregalli B, Guarino A et al. Communicating Unexpected and Violent Death: The Experiences of Police Officers and Health Care Professionals. *Int J Environ Res Public Health* 2022; 19:11030. doi: 10.3390/ijerph191711030.

Hospice UK (2024) *Care After Death: Registered Nurse Verification of Expected Adult Death (RNVoEAD) Guidance. Sixth Edition*.

Marie Curie (May 2023) *How to tell other people about someone's death*.

Naik SA. Death in the hospital: Breaking the bad news to the bereaved family. *Indian J Crit Care Med* 2013; 17:178-181. doi: 10.4103/0972-5229.117067.

NHS Blood and Transplant. *Consent and authorisation. Clinical guidance around gaining consent and authorisation from a donor family*. (A collection of video resources which include, among other topics, breaking bad news).

NHS Education for Scotland. *Communication with those who are bereaved.* (Accessed October 2024)

NHS Blood and Transplant. *Diagnosing death using neurological criteria*. An educational tool for healthcare professionals.

Reid M, McDowell J, Hoskins R. Breaking news of death to relatives. *Nurs Times* 2011 Feb 8-14;107(5):12-5. PMID: 21473310.

Royal College of Nursing. *Confirmation or verification of death by registered nurses*.

Royal College of Obstetricians and Gynaecologists (2024) *Managing Events Surrounding a Maternal Death and Supporting the Family and Staff. Good Practice Paper No.18*.

Appendix 1
Summary of changes from the 2008 Code

The first UK Code of Practice for diagnosing death was published in 1976 by the Conference of Medical Royal Colleges and their Faculties.[1] All subsequent Codes have been published by the Conference of Medical Royal Colleges or, following its renaming in 1996, the Academy of Medical Royal Colleges. Updates to the Code occurred in 1979,[2] 1981,[3] 1998,[4] and in 2008.[5] The Academy considered it good medical practice to update the 2008 Code. A task and finish working group was established for this purpose in July 2022.

In updating the 2008 Code the working group adopted the following principles:

- The previous Codes have each received widespread professional and legal acceptance. The update to the Code was therefore written in the same tradition of providing authoritative guidance for the diagnosis and confirmation of death in the UK.
- While medicine is always evolving, no new science has altered the fundamentals to the criteria used to diagnose and confirm death as outlined in previous Codes. Indeed, doctors diagnosing death using neurological criteria in 2025 would recognise that little has changed since the 1976 Code. The working group therefore considered their role to be one of updating and evolving the 2008 Code.
- The working group was cognisant of their responsibility to clearly articulate the diagnostic criteria by which death can be confirmed in an accurate, standardised and timely manner, whatever the circumstance in which the death has occurred.
- Maintaining safety and confidence in the diagnosis of death was the working group's highest priority. Where necessary, the Code was strengthened to ensure that any lessons from the very rare cases of misdiagnosis, which have occurred in the UK and elsewhere in the world, were incorporated.
- Where possible the Code was written to complement and align across all ages and with other international guidelines. This is in keeping with other international efforts seeking to achieve greater alignment between countries.
- A goal of the working group was to support healthcare professionals communication with patients, their families and the public.
- A hope of the working group was that the updated Code would increase healthcare professionals' and public understanding of how we know when someone has died.

Major changes from the 2008 Code

Table 2 provides a summary of major changes from the 2008 Code.

Table 2. Summary of major changes from the 2008 Code

Major change	Detail	Explanation
Addition of somatic criteria ***[Section 4]***	Somatic criteria are appropriate to use when death follows overwhelming physical trauma or when death is suspected to have occurred a considerable time before.	The 2008 Code only alluded to somatic criteria. In the 2025 Code, somatic criteria are explicitly described as one of three criteria which can be used to diagnose and confirm death.
Time of death in neurological criteria ***[Section 6]***	It is recommended that death is confirmed using neurological criteria at the time of completion of the second set of clinical tests, or if ancillary investigations are used after clinical testing, the point at which the final two doctors undertaking the process are satisfied that all the relevant neurological criteria to diagnose and confirm death are met.	The working group reconsidered the time of death in neurological criteria. Recording the time of death retrospectively to the first set of tests sometimes causes confusion. The group considered it best practice to align the UK with international practice.
The neurological criteria apnoea test starting and end arterial blood targets ***[Section 6]***	Start. $PaCO_2 \geq 5.3$ KPa Time. Minimum 5 minutes Rise. $PaCO_2 \geq 2.7$ kPA End. $PaCO_2 \geq 8.0$ kPa, pH < 7.3	Allows the same apnoea test starting and end arterial blood targets to be used across all age groups in the UK. Provides greater alignment to other international apnoea tests.
The age categories in neurological criteria ***[Section 6 and Appendix 2]***	Age Categories *Below 37-weeks gestation (post menstrual)*, the diagnosis of death using neurological criteria cannot be confidently made.	Further detail can be found by referring to **Appendix 2**, 2025 RCPCH update.

Table 2. Summary of major changes from the 2008 Code (cont.)

Major change	Detail	Explanation
The age categories in neurological criteria ***[Section 6 and Appendix 2]*** *(cont.)*	*From 37-weeks corrected gestation (post menstrual) to 2-years corrected age post term*, the diagnosis of death using neurological criteria can be confidently made by following the Code provided the following three caveats are followed: 1. Neurological criteria should not be applied until at least 24 hours following the loss of the last observed brainstem reflex or spontaneous breath. 2. The interval between clinical tests should be 24 hours. 3. The use of ancillary investigations cannot be recommended to support a diagnosis of death using neurological criteria in children under 2-years of age. *Above 2-years corrected age post term*, the diagnosis of death using neurological criteria can be confidently made by following the Code applicable to adults.	
Addition of a communication section ***[Section 7]***	Advice and guidance provided for communication in the period around when the diagnosis and confirmation of death occurs.	Not only must death be diagnosed and confirmed in an accurate, standardised, and timely manner, but it must also be communicated clearly and respectfully.

Addition of somatic criteria ***[Section 4]***

An addition to the Code is the inclusion of somatic criteria. The 2008 Code alluded to the use of somatic criteria, with its description of 'clear signs that are pathognomonic of death (hypostasis, rigor mortis)'.[5] Somatic criteria are historically ancient and are usually visible from external inspection of the body. The criteria are important in forensic, midwifery, the ambulance services and other community medical, nursing and emergency services. The Association of Ambulance Chief Executives (AACE) and Joint Royal Colleges Ambulance Liaison Committee (JRCALC) describe such criteria in their guidance for paramedics and other relevant healthcare professionals entitled *'Conditions unequivocally associated with death.'*[17] These unequivocal signs of death provide reassurance to healthcare professionals and families as to why cardiopulmonary resuscitation should not be attempted.

The working group considered it of benefit to bring all the criteria which might be used to diagnose and confirm death into one authoritative document. Somatic criteria are therefore explicitly described as one of three criteria which can be used to diagnose and confirm death.

Change to the time of death in neurological criteria ***[Section 6]***

We recommend that the UK change, and so align with nearly every other country, to confirming death using neurological criteria at the time when the healthcare professionals are satisfied all the relevant criteria to diagnose death are met. This would ordinarily be at the time of completion of the second set of clinical tests, or if ancillary investigations are used after clinical testing, the point at which the final two doctors undertaking the process are satisfied that all the relevant neurological criteria to diagnose and confirm death are met.

Historically in the UK, the time of death has been retrospectively timed to the conclusion of the first set of clinical tests performed to exclude brainstem function.[32] The second set of clinical tests was perceived to be confirmation of what had been found at the conclusion of the first set of tests, and since the first set of tests was carried out because death was suspected it followed that time of death should be retrospectively timed. The change to the Code, confirming death after two sets of tests, reflects the evolving recommendation for two mandated sets of clinical tests of brainstem function. The history of the change in the number of required clinical tests is that in 1976 it was considered 'customary' to repeat the tests,[1] in 1981 it was recommended that the tests 'should nevertheless be repeated,'[3] while in the 1998 Code this became 'two sets of tests should always be performed,'[4] and finally in the 2008 Code, and repeated in this updated Code, the requirement is that testing 'must always be performed on two occasions'.[5] Few doctors who use neurological criteria today would hold to the diagnosis being complete until the second set of neurological tests confirms the absence of brainstem function. While two sets of tests are not mandated in all countries the working group had no desire to depart from the 2008 Code and the mandated requirement for two sets of clinical tests, including two apnoea tests.

Internationally, the standard is to time death to the point when the healthcare professionals are satisfied all the relevant criteria to diagnose and confirm death using neurological criteria are met **[Table 3]**. Of countries (known to the working group) that require two sets of tests, no other country records the time of death as the completion of the first set of tests. The working group could not identify any justification for why the UK should be any different to its international peers regarding the time of death. This timing is particularly relevant when there is a significant interval between the tests. Therefore, the group concluded that the time of death that causes the least confusion will be the time when the doctors involved in carrying out the clinical tests are satisfied all the relevant neurological criteria to diagnose and confirm death are met. This would usually be at the time of completion of the second set of clinical tests. When ancillary investigations are required to confirm death, and are carried out after clinical testing, the time of death should be the point at which the final two doctors undertaking the process are satisfied that all the relevant neurological criteria to diagnose and confirm death are met, with the support of ancillary investigations **[6.51 to 6.53]**.

Given that families increasingly witness the second set of tests and want to be with their loved one at the recorded time of death, we hope this move will be welcomed by families and healthcare professionals.

To date, the courts have ordinarily deferred to healthcare professionals to provide a time of death. We see no reason a change to timing death to the point when the healthcare professionals are satisfied all the relevant criteria to diagnose death are met, rather than retrospectively timing death to the conclusion of the first set of tests, would not be equally supported.

Table 3. International practice examples in the time of death using neurological criteria

International Guidance	Time of death
The World Brain Death Project[8]	"...if 2 examinations are required to declare death, the time of death be the time that the second examination is completed." "...if ancillary testing is performed, the time of death be documented as the time that the ancillary test results are formally interpreted and documented by the attending physician"
Republic of Ireland[33]	"At the end of the second apnoea test, if there is no ventilatory response and the preconditions for a clinical diagnosis of Brain Death have been satisfied, the patient is declared dead and the time and date noted. This is the official time of death."
ANZICS[9]	"The time of death should be recorded as the time the second medical practitioner determines that death has occurred whether this is by clinical examination alone or with the assistance of imaging. The rationale for this recommendation is that the process of determining death is only complete at this time."
Canada[11]	"...the legal time of death is recorded as the time of completion of the last test required to fulfil death determination criteria." In the majority of Canada only one set of tests is required, however, "When legislation requires that death must be determined by two medical practitioners/physicians for the purposes of organ donation, the legal time of death in Canada is still marked by the time at the first determination."
USA[12]	"...clinicians must assign the time of death as the time during the final apnea test (if more than 1 is performed) that the ABG results are reported and demonstrate that the $PaCO_2$ and pH levels are consistent with [Brain Death/Death by Neurologic criteria]." "For patients in whom an ancillary test is required and performed, clinicians... must assign the time of death as the time an attending clinician (e.g. nuclear medicine physician or angiographer) documents in the medical record that the ancillary test results are consistent with [Brain Death/Death by Neurologic criteria]."

Change to the neurological criteria apnoea test starting and end arterial blood targets ***[Section 6]***

We recommend that the apnoea test starting and end arterial blood targets be changed to align more closely to other international apnoea tests. Additionally we recommend that the same apnoea test starting and end arterial blood targets be used across all age groups in the UK.

The working group had no safety concerns with the current UK apnoea test as outlined in the 2008 Code. The current UK apnoea test has been used to diagnose death using neurological criteria safely and confidently in tens of thousands of patients since 2008. It has sometimes been described in the literature as a type of augmented carbon dioxide apnoea test, as the starting $PaCO_2 \geq 6.0$ kPa is higher than the typical starting point in other international practice. The UK starting $PaCO_2$ level was specifically recognised as an option for use to minimise the time required for the carbon dioxide to rise to the desired levels in guidance by the Australian and New Zealand Intensive Care Society.[9]

On reviewing other international guidance on the apnoea test in neurological criteria the working group decided to use the opportunity created by the update to align the UK more closely with international peers. There is, however, no agreed worldwide apnoea test. Efforts from groups like the World Brain Death Project,[8] are helpful in promoting greater international alignment but apnoea test guidance published subsequently continues to highlight variability in the required $PaCO_2$ at the start and end of the test, if a specified rise in $PaCO_2$ is needed, the end pH and the observation time. Indeed the UK is rare in mandating a required observation time (minimum 5 minutes) for the apnoea test. The observation time in many other international guidance, while longer, are given as a suggested time to predict when the target end $PaCO_2$ and end pH might have been reached, rather than the time being considered important in its own right. Augmentation with exogenous carbon dioxide is used in some international guidance as a recommended method to reduce the observation time.

What is apparent in the international guidance is that there is the most worldwide alignment for a target end $PaCO_2 \geq 60$ mmHg (8.0 kPa) and end arterial pH < 7.3. The apnoea test described in the 2008 Code almost invariably achieves these end arterial blood targets, so the working group considered adoption of these targets would only be making specific what already occurs in practice. Some countries also require a rise of $PaCO_2 \geq 20$ mmHg (2.7 kPa) during the apnoea test. This rise in carbon dioxide is already a requirement in the RCPCH 2015 guidance for the neonatal and young infant apnoea test in the UK.[6]

After much discussion the working group recommends a pragmatic change to the UK apnoea test which will more closely align to international practice and bring the significant benefit that the same apnoea test can be used across all age groups in the UK. We therefore recommend that the apnoea test should commence at a starting $PaCO_2$ of at least 5.3 kPa, and end when the $PaCO_2$ is at least 8.0 kPa and the pH less than 7.3, provided there has been a rise in $PaCO_2$ of at least 2.7 kPa. This change is very close to the apnoea test recommended for neonates by the RCPCH in 2015.[6] The mandated minimum

of 5 minutes of observation remains unchanged. It was accepted that with the new lower starting $PaCO_2$ [≥ 5.3 kPa] compared to the previous 2008 Code [≥ 6.0 kPa], some doctors may choose to delay taking the confirmatory arterial blood gas sample immediately at 5 minutes, to increase the certainty that the $PaCO_2$ and pH have reached the apnoea end arterial blood targets. The *5 minutes observation is a minimum*. The change to the apnoea test is summarised in **Table 2**.

This is not the first change to the apnoea test in the UK. The evolution of the apnoea test over the previous decades in the UK is summarised in **Table 4**.

Table 4. Summary of UK apnoea tests in the Codes of practice

UK Code	Apnoea test description
1976[1]	End. $PaCO_2$ ≥ 6.7 kPa [50 mmHg]. *Point of care blood gas analysis available.* Augmentation via the ventilator with 5% CO_2 in oxygen. Start. $PaCO_2$ 5.3 – 6.0 kPa No minimum time specified. *Point of care blood gas analysis not available.* Augmentation via the ventilator with 100% O_2 for 10 minutes then 5% CO_2 for 5 minutes. Disconnect for 10 minutes.
1998[4]	End. $PaCO_2$ ≥ 6.65 kPa [50 mmHg]. If the facility for administering 5% CO_2 in oxygen exists, this is the preferred method for performing this test. Augmentation via the ventilator with 100% O_2 for 10 minutes then 5% CO_2 for 5 minutes. Disconnect for 10 minutes.
2008[5]	Start. $PaCO_2$ ≥ 6.0 kPa, pH < 7.4 Time. Minimum 5 minutes Rise. $PaCO_2$ > 0.5 kPa
2015 RCPCH[6]	Start. $PaCO_2$ ≥ 5.3 kPa Rise. $PaCO_2$ > 2.7 kPa End. $PaCO_2$ > 8.0 kPa
2025	Start. $PaCO_2$ ≥ 5.3 kPa Time. Minimum 5 minutes Rise. $PaCO_2$ ≥ 2.7 kPA End. $PaCO_2$ ≥ 8.0 kPa, pH < 7.3

Royal College of Paediatrics and Child Health update to neurological criteria ***[Section 6 and Appendix 2]***

In collaboration and parallel to the Academy working group update of the 2008 Code, a working group was convened by the RCPCH for the purpose of focusing on special issues that should be considered in infants and children regarding the diagnosis and confirmation of death using neurological criteria.

The 2025 RCPCH update is presented in **Appendix 2**. The 2025 RCPCH update replaces and supersedes the 2015 RCPCH guidance *The diagnosis of death by neurological criteria in infants less than two months old*,[6] and the 1991 (reproduced in full in the 2008 Code) *Diagnosis of brain-stem death in infants and children: a working party report of the British Paediatric Association*.[7]

The updated Code endorses the 2025 RCPCH update on the diagnosis and confirmation of death using neurological criteria in infants, children, and adolescents.

Previously an age distinction was made for the purpose of neurological criteria between 37-weeks corrected gestation (post menstrual) to 2-months post term, where the RCPCH 2015 guidance applied and any individual over 2-months of age where the 2008 Code applied. While a minimum of 37-weeks has moderate international support, the age at which an infant transitioned to undergoing the same criteria for the diagnosis and confirmation of death using neurological criteria as adults is internationally variable. As a pragmatic solution, taking together all the available evidence, combined with a desire to align more closely to international guidance, and without intending to cast doubt on any previous diagnosis of death in the UK, the working group recommends the age of *≥24-months (2-years corrected age for children born prematurely)* as being the age when a child can undergo clinical assessment for the diagnosis and confirmation of death using neurological criteria with the same criteria applicable to adults.

Therefore, the diagnosis of death using neurological criteria can be confidently used in children of all ages, from 37-weeks corrected gestation (post menstrual) onwards, using the same clinical criteria as in adults, provided a few caveats are observed in the age less than 24-months (*2-years corrected age for children born prematurely*).

In the 2025 RCPCH update and the Code, when a diagnosis and confirmation of death using neurological criteria is being considered, the following age categories and caveats are endorsed:

— Below 37-weeks gestation (post menstrual), the diagnosis of death using neurological criteria cannot be confidently made.

— From 37-weeks corrected gestation (post menstrual) to 2-years corrected age post term, the diagnosis of death using neurological criteria can be confidently made by following the Code provided the following three caveats are followed:

    1. Neurological criteria should not be applied until at least 24 hours following the loss of the last observed brainstem reflex or spontaneous breath.
    2. The interval between clinical tests should be 24 hours.
    3. The use of ancillary investigations cannot be recommended to support a diagnosis of death using neurological criteria in children under 2-years of age.

— Above 2-years corrected age post term, the diagnosis of death using neurological criteria can be confidently made by following the Code using the same criteria applicable to adults.

Standardised documentation for diagnosing and confirming death using neurological criteria, for use in infants and children, should be the responsibility of the relevant societies involved with paediatrics and intensive care. Doctors carrying out the diagnosis should ensure they are always using the most up to date version.

*Addition of a communication section **[Section 7]***

A particular ambition of the updated Code was to better support healthcare professionals communication with patients, their families and the public. This is reflected by the inclusion of a new section on communication. While publications and resources are already available which cover the details of communication around the end of life, the focus in the communication section was to provide some guidance to healthcare professionals on good communication in the period around when the diagnosis and confirmation of death occurs.

Not only must death be diagnosed and confirmed in an accurate, standardised, and timely manner, but it must also be communicated clearly and respectfully. This is to recognise that the death of any individual, at any age, and in any circumstance, is a major event for their family and friends. Additionally, the place and time of death often holds special significance.

Healthcare and professional organisations who train and approve individuals as competent to diagnose and confirm death must also train these individuals in communication around the time of death.

Other changes from the 2008 Code

Changes from the 2008 Code are summarised in **Table 5**.

Table 5. Summary of other changes from the 2008 Code

Change	Detail	Explanation
The terminology in the definition of death ***[Section 2]***	The Code uses the term 'permanent' rather than 'irreversible' when describing the loss of functions that need to have occurred to diagnose and confirm death. That is the "permanent loss of the capacity for consciousness, combined with permanent loss of the capacity to breathe" and the "permanent cessation of brainstem function".	There has been an observable shift worldwide toward use of the word 'permanent' in place of 'irreversible', and the updated Code follows this trend.
Three criteria to diagnose and confirm death: somatic, circulatory and neurological ***[Section 3]***	The Code is explicit in recognising three criteria by which healthcare professionals can diagnose and confirm death. The criterion to use is the one most appropriate to the clinical circumstances.	Previously the 2008 Code only alluded to somatic criteria and its two explicit criteria were called 'death after cardiorespiratory arrest' and 'death in a patient in coma' or 'death following irreversible cessation of brainstem function'.
Who can diagnose and confirm death using somatic and circulatory criteria ***[Section 3, 4 and 5]***	The Code acknowledges that other competent individuals, who are not healthcare professionals, may confirm death. Additionally the Code recognises and is supportive of the existing profession-specific guidance provided for registered nurses, paramedics and other relevant individuals. We hope that the three criteria in the Code act as authoritative guidance for anyone confirming death in the UK or writing profession-specific guidance.	No statute regulates who can diagnose and confirm death. The only exception is in Scotland, where for the specific purpose of deceased organ and tissue donation, it must be a registered medical practitioner. It is only in neurological criteria **[Section 6]** that the Code specifically restricts who may diagnose death.

Table 5. Summary of other changes from the 2008 Code (cont.)

Change	Detail	Explanation
Clarification of the purpose of the 5 minutes observation in circulatory criteria ***[Section 5]***	The purpose of the mandated 5 minutes observation period following cardiorespiratory arrest is to exclude the possibility of spontaneous return (autoresuscitation) of circulation.	This change will satisfy the definition of death requiring permanent cessation of brainstem function. 'Permanent', in this context, means that brainstem function will not resume spontaneously and will not be restored through intervention.
Clarification of the clinical examination required in circulatory criteria ***[Section 5]***	There is no requirement that the healthcare professional palpate for a central pulse or auscultate for breath and heart sounds over the entire 5 minutes. However, the healthcare professional must be physically present and observing the patient for the full 5 minutes and be satisfied their examination is sufficient. If intra-arterial pressure monitoring is used it requires appropriate scaling. The 5 minute assessment period commences with the onset of circulatory arrest (mechanical asystole) and apnoea. Electrical asystole is not required if echocardiography or intra-arterial pressure monitoring can be used. Examining for absence of corneal reflexes is recommended when death is being diagnosed and confirmed soon after cardiorespiratory arrest, rather than in all cases, as was recommended in the 2008 Code.	These areas were a frequent source of questions from the 2008 Code.
Changes to neurological criteria ***[Section 6]***	See the text below for detail.	

Change to the terminology in the definition of death ***[Section 2]***

Worldwide, there has been a shift toward a unified definition of death based on permanent loss of brain function. This is in keeping with the UK's long-held position on the primacy of brain function when diagnosing death. In the Code we have followed the international trend to use the term 'permanent' rather than 'irreversible' when describing the loss of functions that need to have occurred to diagnose and confirm death.[9,11,12] While there is some academic debate about which is the better of the two terms, we consider that referring to 'permanent loss of function' provides greater clarity, consistency and simplicity and better aligns clinical reality for most confirmations of death. Of historic note 'permanent' was the term used in the first Code of Practice in 1976.[1]

Three criteria to diagnose and confirm death ***[Section 3]***

The Code is explicit in recognising three criteria by which healthcare professionals can diagnose and confirm death – somatic, circulatory and neurological criteria. The criterion to use is the one most appropriate to the clinical circumstances.

Previously the 2008 Code only alluded to somatic criteria and it's two explicit criteria were called 'death after cardiorespiratory arrest' and 'death in a patient in coma' or 'death following irreversible cessation of brain-stem function'.[5]

Who can diagnose and confirm death using somatic and circulatory criteria ***[Section 3, 4 and 5]***

No statute regulates who can diagnose and confirm death. The only exception is in Scotland, where for the specific purpose of deceased organ and tissue donation, it must be a registered medical practitioner.[16] It is only in neurological criteria **[Section 6]** that the Code specifically restricts who may diagnose death.

The Code acknowledges that other competent individuals, who are not healthcare professionals, may confirm death using somatic and circulatory criteria. Additionally the Code recognises and is supportive of the existing profession-specific guidance provided for registered nurses,[21] ambulance service and paramedics,[17] and other relevant individuals. We hope that the three criteria in the Code act as authoritative guidance for anyone confirming death in the UK or writing profession-specific guidance.

Clarification of the purpose of the 5 minutes observation in circulatory criteria ***[Section 5]***

The 2008 Code was important because it provided for the first time in the UK authoritative guidance on the diagnosis of death after cardiorespiratory arrest. In the Code we clarify that the purpose of the mandated 5 minutes observation period following

cardiorespiratory arrest is to exclude the possibility of spontaneous return (autoresuscitation) of circulation. This will satisfy the definition of death requiring permanent cessation of brainstem function. 'Permanent', in this context, means that brainstem function will not resume spontaneously and will not be restored through intervention. At 5 minutes the possibility of spontaneous resumption of cardiac function (autoresuscitation) will have passed.[20] It is inappropriate to initiate any intervention which has the potential to restore brainstem function after death has been confirmed.

Clarification of the clinical examination required in circulatory criteria ***[Section 5]***

The following areas were a frequent source of questions from the 2008 Code which the 2025 Code seeks to clarify.

- There is no requirement that the healthcare professional palpate for a central pulse or auscultate for breath and heart sounds over the entire 5 minutes. However, the healthcare professional must be physically present and observing the patient for the full 5 minutes and be satisfied their examination is sufficient.
- If intra-arterial pressure monitoring is used it requires appropriate scaling.
- The 5 minute assessment period commences with the onset of circulatory arrest (mechanical asystole) and apnoea. Electrical asystole is not required if echocardiography or intra-arterial pressure monitoring can be used.
- Examining for absence of corneal reflexes is recommended when death is being diagnosed and confirmed soon after cardiorespiratory arrest, rather than in all cases. This is a change from the 2008 Code.

While there was some discussion regarding replacing supraorbital pressure with a trapezius squeeze, the working group was minded that, unlike supraorbital pressure which examines cranial nerves V and VII, the trapezius squeeze only indirectly examines brainstem function.

Changes to neurological criteria ***[Section 6]***

The working group unhesitatingly concluded that the previous neurological criteria, as outlined in the 2008 Code, was a safe practice that healthcare professionals, patient families, and society could be fully confident in. This conclusion does not mean that neurological criteria for diagnosing and confirming death should not evolve with time. The reasoning for the major changes to time of death, the apnoea test, and the age categories in neurological criteria have already been discussed above. The other changes listed below were made for the purpose of providing greater clarity where ambiguity may have existed or, where considered necessary, to strengthen the neurological criteria requirements. Greater alignment with other international guidance was sought wherever possible.

Changes of note are:

- Clarification that the diagnosis can be made by doctors who have had full registration with the GMC or equivalent international professional body recognised by the GMC, for more than 5 years **[6.6]**.
- Clarification that those diagnosing and confirming death should not be acting on behalf of the organ retrieval and transplant service at that time and must not be involved in the allocation of any of the patient's organs or tissues that may subsequently be donated for transplantation **[6.6]**.
- Clarification that a minimum of two doctors, but on occasion up to four doctors, will diagnose death using neurological criteria in any patient **[6.8]**.
- Encouragement that families should be offered the opportunity to observe a set of clinical tests to confirm death using neurological criteria. Often, the second set of tests is the most appropriate and useful for families to witness **[6.9]**.
- Recognition of the vital education and training role that healthcare professional bodies have in supporting the use of neurological criteria **[6.10]**, creating and promulgating nationally endorsed testing forms for neurological criteria **[6.11]**, and in reviewing and sharing learning from any unusual, difficult and challenging cases, or considering the impact of neurological criteria from the emergence of new therapeutic modalities **[6.12]**.
- Clarification that establishing an aetiology severe enough to cause permanent cessation of brainstem function must include neuroimaging but might also include electrophysiological or invasive intracranial pressure measurements **[6.15]**.
- Expanded discussion of the possibility for non-brain mediated movements and the need to explain the significance to the patient's family and other staff **[6.19]**.
- The eight 'red flag' patient groups, which are present in the endorsed 'Forms for the Diagnosis of Death using Neurological Criteria' by the Faculty of Intensive Care Medicine, Intensive Care Society, RCPCH and others, and which are in current use in the UK, highlight UK and worldwide case reports where additional diagnostic caution might be required. Specific 'red flags' were not present in the 2008 Code, though their principles were. These patient groups have now been fully incorporated, and described in more detail, within the neurological criteria preconditions. As such the term 'red flag' is no longer used or required. **[6.22 to 6.24, 6.28, 6.29, 6.35 to 6.37]**.
- The adoption of a minimum core temperature of 36°C. The target of 36°C was chosen to ensure greater consistency with other international standards **[6.27]**.
- Prior to clinical testing, a peripheral nerve stimulator or other recognised method (e.g. presence of deep-tendon reflexes, electromyography) should be used to confirm that adequate neuromuscular function is present **[6.29]**. A requirement for demonstrating a response to nerve stimulation (or deep tendon reflexes) was present in the 2008 Code and older versions but is now more specific.

- Expanded discussion on cervical spinal cord pathology **[6.30]**.
- Minimum sodium concentration as a precondition for testing increased from 115 to 125 mmol/L. This avoids clinical testing at an extremely low level from normal. No member of the working group was aware of testing having ever occurred at such extremely low levels. No change was made to the upper limit of 160 mmol/L **[6.33a]**.
- Given that the eyes are required in the clinical testing of three of the six brainstem reflexes used in neurological criteria, it was decided to specifically recommend that it must be possible to examine both eyes and there should be no reason to suspect an eye injury or abnormality would prevent the reflex occurring if it could. In the case of an inability to examine either eye, for whatever reason, it was recommended that ancillary investigation would be required to support a diagnosis of death using neurological criteria **[6.42]**. Similarly, both ears must be able to be accessed for the vestibulo-ocular reflex. This change aligns the UK to other international guidance.
- Providing greater guidance on the role of ancillary investigations in supporting a diagnosis of death using neurological criteria. The Code recognises that technology for ancillary investigation is rapidly evolving, such that healthcare professional organisations, with appropriate expertise, are best placed to maintain up to date national guidance on ancillary investigations **[6.54 to 6.67]**.
- Providing greater guidance, while recognising the need for expert supplementary guidance, when diagnosing death using neurological criteria in a patient supported on ECMO **[6.68]**.
- Providing advice on managing requests to prevent the application of neurological criteria or to continue somatic support after death has been confirmed **[6.69]**.

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Appendix 2

Royal College of Paediatrics and Child Health 2025 update on the diagnosis of death using neurological criteria in infants, children, and adolescents

RCPCH
Royal College of Paediatrics and Child Health
Leading the way in Children's Health

Appendix 2 was written by the Royal College of Paediatrics and Child Health working group

Contents

A1. Executive summary

The updated 2025 Academy of Medical Royal Colleges (Academy) Code of Practice (the Code) endorses this 2025 Royal College of Paediatrics and Child Health (RCPCH) update on the diagnosis and confirmation of death using neurological criteria in infants, children, and adolescents.

This update was produced by a working group appointed by the RCPCH, who unequivocally support the use of the Code for those making the diagnosis and confirming death using neurological criteria in *all children* up to the age of 18-years. This content is intended to be read with the Code and its appendices. All paediatricians involved in the diagnosis and confirmation of death should familiarise themselves with the Code.

Users of the 2025 Academy Code will notice that there are differences between the 2008 Academy *A Code of Practice for the diagnosis and confirmation of death,*[A1] the 2015 RCPCH report on *The diagnosis of death by neurological criteria in infants less than two months old,*[A2] and the new 2025 Academy Code and the 2025 RCPCH update **[the Code, Appendix 1]**. In general, these changes should be seen as an attempt to minimise differences in guidance between the 2008 Academy Code and the 2015 RCPCH report, and between the approaches to clinical tests of brainstem function described in international guidelines published during 2020 to 2023.[A3- A6] These changes are summarised in the Additional Figure in **Section A11** and must not be interpreted as representing an alteration in the validity of previous diagnoses of death using neurological criteria in infants, children, and adolescents. Rather, they are a reasoned approach to removing unnecessary complexity and difference with multiple thresholds in age, temperature, apnoea testing, and testing intervals that exist around the world. That is, these previous differences between jurisdictions do not impact prior diagnoses; the emphasis of this 2025 RCPCH update is to seek simplification and consistency.

A1.1 Background clinical context

The diagnosis and confirmation of death using neurological criteria is an infrequent event in paediatric and neonatal intensive care units in the United Kingdom (UK). Over the eight years (2015 to 2022) since the 2015 RCPCH report on the *diagnosis of death by neurological criteria in infants less than two months old,*[A2] there were 393 children who underwent clinical examination for the diagnosis and confirmation of death using neurological criteria (i.e. an average of 1 to 2 children per year, per intensive care unit). In the eight years there were very few young children with this diagnosis: 12, aged under 2-months; 43, aged

2-months to 1-year; and 29 aged between 1- and 2-years.[A7] In the UK these data translate to, on average, each paediatric intensive care unit confirming death using neurological criteria in under 2-year-olds, less than once every 2 years.

Therefore, the working group sought to maximise diagnostic clarity in infants and children when there is suspicion that a child with *devastating brain injury* who is supported with mechanical ventilation, has died. In this process, the working group used five key principles to guide the development of the 2025 RCPCH update:

- Consideration of any new evidence since the 2015 RCPCH report on *the diagnosis of death by neurological criteria in infants less than two months old*.[A2]
- Alignment with the Code, and thereby minimising differences across the whole age span, unless overruled by other principles.
- Consideration of paediatric guidelines published during 2020 to 2023 from International, Australia and New Zealand, Canada, and the United States professional groups.[A3-A6]
- Maximum safeguarding of the security of the diagnosis and confirmation of death using neurological criteria in children of any age.
- Feasibility, when considering the use of ancillary investigations in children; specifically, the extent of expertise and experience in the National Health Service (NHS) to inform a pragmatic approach for such infrequent investigations and diagnoses.

A1.2 Terminology

The concepts of 'brain death' and 'brainstem death' are not used in this 2025 RCPCH update. The terminology that has been adopted rests on the concept of a unitary state of death as described in the Code, and the working group has specifically focused on *the diagnosis and confirmation of death using neurological criteria*.

A1.3 Clinical criteria for the diagnosis and confirmation of death using neurological criteria applicable to all individuals from the age of 37-weeks corrected gestation (post menstrual), onwards

The preconditions specified in the 2008 Academy Code (from the 1991 Report of the British Paediatric Association) concluded that "given the current state of knowledge it is rarely possible confidently to diagnose brain-stem death at this age" [under 2-months old].[A1] This position was changed in the 2015 RCPCH Report after review of the international evidence.[A2] The report concluded that the diagnosis of death by neurological criteria using the clinical examination outlined in the 2008 Academy Code to establish death in adults, children, and older infants, can be confidently used for infants from 37-weeks corrected gestation (post menstrual) to 2-months post term. The 2025 RCPCH update goes beyond this statement to reinforce the position that the diagnosis of death by neurological criteria can be confidently used in children of *all* ages, from 37-weeks corrected gestation (post menstrual) onwards, using the same clinical criteria as in adults **[the Code, 6.39 to 6.53]**. That is, when correctly applied, clinical neurological criteria confirming the permanent loss of the capacity for consciousness combined with permanent loss of the capacity to breathe, can unequivocally diagnose death **[the Code, 2.2]**.

A1.4 Impact of immaturity on the diagnosis and confirmation of death using neurological criteria in infants and young children aged 37-weeks corrected gestation to 2-years corrected age post term

The immaturity of the newborn, infant, and young child means there are three precautionary measures that should be considered when diagnosing and confirming death using neurological criteria:

A1.4.1 Apnoea testing in under 2-year-olds

In the 2015 RCPCH report the need for a stronger hypercarbic stimulus was considered necessary in the infant aged under 2-months to establish respiratory unresponsiveness.[A2] At that time, this approach was consistent with other international recommendations but different from the 2008 Academy Code for all individuals older than 2-months.[A1] In this 2025 RCPCH update, the criteria for apnoea

testing are now similar across all international practices, and age categories.[A3-A6] That is, at the end of a minimum 5 minute apnoea test the following should be noted:

- The threshold arterial blood partial pressure of carbon dioxide ($PaCO_2$) level during the apnoea test should be a clear rise of at least 2.7 kPa (>20 mmHg), above a baseline of at least 5.3 kPa (40 mmHg), to at least 8.0 kPa (60 mmHg) with no respiratory response at that level
- The arterial pH should also be less than 7.3 (or $[H^+]$ >50 nmol/L).

The only differences between age groups (from 37-weeks corrected gestation, post menstrual, to 2-years post term; and 2-years to adults) is in the interval between tests. The interval between tests in those aged under 2-years should be 24 hours, while in children aged 2-years or older no delay is required as long as the patient's arterial blood gases and baseline parameters have returned to appropriate pre-test levels **[the Code, 6.49 and 6.50]**.

A1.4.2 Cranial vault development

During development, the postnatal age at which there is fusing of the cranial vault sutures and the closing of the anterior fontanelle may influence the vulnerability of brainstem function in infants and young children with devastating brain injury.[A6] The anterior fontanelle usually closes between 13- and 24-months (corrected gestation) but may be delayed in certain genetic or metabolic conditions.[A8, A9] In such cases, the distensibility of the dura and cranial vault may protect brainstem function when there is devastating brain injury and cerebral oedema.[A10, A11] This pattern of pathophysiology means the timing of clinical testing in infants and young children aged under 2-years-old should be distinct and longer to that used in older children and adults. This pathophysiology may also be relevant in young children undergoing neurosurgical decompressive craniectomy. These unique aspects of cranial vault development have additional implications on the use of ancillary imaging investigations in the under 2-year-old.

A1.4.3 Ancillary investigations

The 2015 RCPCH report concluded that ancillary investigations (either using electroencephalography or cerebral blood flow and perfusion imaging) are not required to make a diagnosis and confirm death using neurological criteria in infants from 37-weeks corrected gestation (post menstrual) to 2-months post term. In 2015, the RCPCH recommended that in cases where a clinical diagnosis is not possible, ancillary investigations are not sufficiently robust to support the confident diagnosis in infants. Review of the published evidence up to the end of 2023,[A12, A13] and of UK clinical experience (2015 to 2022)[A7] confirm this previous position. Therefore, at this time the working group cannot recommend using ancillary investigations to support a diagnosis of death using neurological criteria

in children under 2-years of age in situations where there is uncertainty about the results of the clinical examination (e.g. due to extensive facio-maxillary injuries, high cervical cord injury, or inability to perform the apnoea test) **[Sections A7 and A9]**.

A1.5 Mechanism of devastating brain injury

The causes of devastating brain injury can vary by age in children and be of very different patterns to those seen in adults with severe traumatic brain injury, cardiac arrest, or cerebrovascular stroke. For example, birth-related or out-of-hospital cardiac arrest causing hypoxic-ischaemic injury in neonates and young infants; or abusive head trauma and spinal cord injury in infants and toddlers presenting with apnoea, and brain and retinal haemorrhages; or genetic-metabolic disorders causing cerebral oedema at any age; or blocked ventriculoperitoneal shunt device causing cerebellar tonsillar herniation at any age.

In the 2015 RCPCH report, a special case was made for considerations in young infants with hypoxic-ischaemic encephalopathy.[A2] This 2025 RCPCH update places renewed emphasis on the importance of excluding potentially reversible causes of apnoea before conducting the apnoea test. Therefore, in young children, where trauma may be the mechanism of injury, the presence of cervical spinal cord injury must be considered and cranial and upper cervical spine computed tomography (CT) and, as indicated, magnetic resonance imaging (MRI) scans should be performed.[A14] At all ages, where imaging demonstrates cervical spinal cord pathology, the apnoea test cannot reliably be used *in isolation* to demonstrate loss of the capacity to breathe **[Section A6. The Code, 6.30]**.[A15] In these circumstances, the clinical assessment can be supplemented with an ancillary investigation in children older than 2-years, but in the under 2-year-olds the limitations of using ancillary tests will need to be recognised **[A1.4.3]**.

A1.6 Conclusion

Figure A1 summarises the 2025 RCPCH updated clinician guidance for diagnosing and confirming death using neurological criteria in the critically ill infant, child, or adolescent, mapped to the framework of the Code: from admission to an intensive care unit with devastating brain injury and the suspicion that death has occurred during mechanical ventilation, through to the diagnosis of death using clinical testing or supported with ancillary investigations.

Figure A1. 2025 RCPCH update for the diagnosis of death using neurological criteria in infants, children, and adolescents (in keeping with the 2025 Academy Code)

The lower gestational age at which the diagnosis and confirmation of death using neurological criteria can be made is 37-weeks + 0 days after the date of the mother's last menstrual period (considered term gestation). In premature babies born <37-weeks, age is corrected for prematurity ('corrected age') **[Section A7]**.

Criterion 1. In infants, young children, and adolescents suffering with a devastating brain injury:

- The cause and depth of coma should be established.
- Life supporting treatments should be continued when there is potential for recovery.

Criterion 2. If there is deterioration in which progression to death is suspected, then:

- Two doctors who are authorised and nominated to work together will, first, review the preconditions necessary for clinical testing.

Criterion 3a. The two doctors will ensure the following preconditions are met:

- Aetiology severe enough to cause death.
- Assessment period sufficient to exclude the potential for recovery (e.g. severe traumatic brain injury, intracranial haemorrhage, hypoxic-ischaemic encephalopathy, post-cardiac arrest hypothermia); a minimum of 24 hours is recommended for age <24-months **[Section A6]**.
- Exclusion of potentially reversible factors, e.g. hypothermia, depressant drugs, neuromuscular, cervical spinal cord pathology, cardiorespiratory, electrolyte and metabolic, endocrine.

Criterion 3b. The two doctors will ensure that additional caution in diagnosis is considered in certain uncommon circumstances:

- Isolated posterior fossa or brainstem lesion.
- Therapeutic decompressive craniectomy and severe skull fractures.
- Use of therapeutic steroids to reduce cerebral oedema.
- Age <24-months **[Section A7]**.

Criterion 4. The two doctors will carry out two sets of clinical tests, with each set of tests including:

- Pupillary reflex (cranial nerves [CN] II, III)
- Corneal reflex (CN V, VII)
- Vestibulo-ocular reflex (CN III, IV, VI, VIII)
- Motor response (CN V, VII)
- Gag reflex (CN IX, X) and cough reflex (CN X)
- Apnoea test: starting $PaCO_2$ ≥5.3 kPa; observe for ≥5 minutes; and at the end confirm $PaCO_2$ ≥8.0 kPa (rise of ≥2.7 kPa), and pH <7.3 **[Section A8]**.

Figure A1. 2025 RCPCH update for the diagnosis of death using neurological criteria in infants, children, and adolescents (in keeping with the 2025 Academy Code) (cont.)

Criterion 5. When two doctors have completed two sets of clinical tests, the diagnosis of death is confirmed using neurological criteria. Time of death is taken as the time of completing the second tests. The age-appropriate interval between tests are as follows:

- **Age <24-months**: a minimum of 24 hours.
- **Age ≥24-months**: the interval between testing need not be prolonged as long as the patient's arterial blood gases and baseline parameters have returned to appropriate pre-test levels before the second apnoea test.

Criterion 6. In some circumstances clinical testing cannot be carried out or completed. These include the following **[Criterion 3b]**

- Inability to examine both eyes.
- Cervical spinal cord pathology.
- Depressant drugs.
- Abnormal urea, ammonia, or metabolic disorder.
- Isolated posterior fossa or brainstem lesion.
- Decompressive craniectomy.
- Uncertainty in the interpretation of possible spinally mediated movements.
- Multiple severe skull fractures.
- Therapeutic steroids to reduce brain oedema.

Criterion 7. If any of the diagnoses in **Criterion 6** are present, or of concern, then proceed according to patient age. When complete, the diagnosis of death is confirmed, and the time of death is taken as the time of completing the ancillary investigation **[Section A9]**. In the absence of ancillary investigation, diagnosis is not possible **[Section A9]**:

- **Age <24-months**: In infants and very young children, the diagnosis of death using neurological criteria may be supported by delaying clinical testing and/or considering expert advice. In some instances, however, the absence of the availability of usable ancillary tests will mean that the diagnosis of death using neurological criteria is unlikely to be a feasible diagnosis in this age-group **[Section A6]**.
- **Age ≥24-months**: There is no consensus as to which ancillary investigation can be recommended. For example, whether to use computed tomography angiography (CTA) and/or magnetic resonance angiography (MRA), or radionuclide imaging of brain perfusion with hexamethyl propylenamine oxime single photon emission computed tomography (HMPAO SPECT). Regarding both modalities of investigation, experience in the NHS is limited and until further recommendations become available these investigations are for specialist centres in older children.

A2. Introduction

This 2025 RCPCH update has been produced by a working group appointed by the RCPCH to update the contemporary practice of diagnosing and confirming death using neurological criteria in children in the UK. The previous deliberations by the RCPCH (previously known as the British Paediatric Association (BPA)) were:

- 1991: which was also included in the 2008 Academy *A Code of Practice for the Diagnosis and Confirmation of Death*.[A1]
- 2015: the RCPCH document *The diagnosis of death by neurological criteria in infants less than two months old*.[A2]

The 2015 RCPCH report[A2] superseded the 2008 Academy Code (and the 1991 BPA report).[A1] In 2015, the RCPCH concluded that the diagnosis of death by neurological criteria using the clinical examination criteria employed to diagnose and confirm death in adults, children, and older infants, could be confidently used at all ages from 37-weeks corrected gestation (post menstrual), onwards. In 2020, 2021, and 2023, one international group, and three national groups (Australia and New Zealand, Canada, and the United States) published combined and updated adult and paediatric criteria for the determination of death using neurological criteria.[A3-A6] The working group unequivocally accepts the Code definition of death **[Table A1]**. Furthermore, this combined publication of UK adult and paediatric criteria for the diagnosis and confirmation of death using neurological criteria supersedes and replaces all previous documents.

This update is intended to be used with the Code. It is for all UK paediatric and neonatal doctors and other groups involved in the regulation or practice of the health care of critically ill infants and children. It is also relevant to intensive care unit (ICU) professionals practising in units for adult patients since, in contrast to the 2015 RCPCH report, it describes practice for all children up to 18-years of age (some of whom may be cared for in an adult intensive care unit). This update does not include clinician guidance for preterm infants, below 37-weeks' gestation.

There are summary tables used throughout this 2025 RCPCH update. The purpose is to show the unequivocal opinion of the working group in its alignment with the Code, as well as to highlight differences that will be important for clinicians caring for infants and children. Further details about the methodology can be found in the supplemental digital content on the RCPCH website.[A16]

A3. Methodology, objectives and scope

This 2025 RCPCH update takes account of contributions to evidence in the medical literature from 1990 to 2023 relating to the diagnosis of death in children from the age of 37-weeks corrected gestation (post menstrual) to 18-years. This update does not cover broader issues about withdrawal or withholding medical treatment in children, which are covered in a separate 2015 RCPCH Ethics Advisory Committee Report,[A17] neither does it cover issues surrounding organ donation and transplantation.

The methodology used in the 2025 RCPCH update, including development of relevant clinical questions, systematic search of the literature in electronic databases, selection of evidence, and appraisal of the included papers, is described in the supplemental digital content on the RCPCH website.[A16]

The working group focused on four specific issues in which infants and children differ from adults: age or maturity at time of assessment for death using neurological criteria; the apnoea test; ancillary investigations; and consideration of special preconditions. These considerations should be read alongside the Code.

a. Age

In the 2008 Academy Code[A1] and 2015 RCPCH report,[A2] chronological age in children was considered with two discrete groupings: 37-weeks' gestation (post menstrual) to 2-months (post term), and older than 2-months to 18-years (i.e. 17-years and 364-days). Since international jurisdictions now use different age groupings,[A3-A6] the working group reviewed these age cut-offs, and whether there is a need to take a developmental rather than chronological approach to the age precondition for diagnosis and confirmation of death using neurological criteria. Additionally, the working group sought to add definitional clarity around the language used to describe gestation and corrected age **[Section A7]**.

b. Apnoea test

In the 2015 RCPCH report,[A2] special consideration was required for apnoea testing in infants aged less than 2-months post term in recognition that for developmental reasons a more conservative $PaCO_2$ threshold was required. The working group reviewed current guidance about the apnoea test, particularly in relation to age limits and practice in other jurisdictions **[Section A8]**.

c. Ancillary investigations

The 2015 RCPCH report was focused on infants aged 37-weeks' gestation (post menstrual) to 2-months (post term).[A2] The report concluded that when the clinical examination could not be used to diagnose and confirm death by neurological criteria, ancillary investigations (whether electroencephalography or brain imaging) should not be used to support the diagnosis. In 2015, there was a paucity of evidence and the literature searches needed to include studies in infants up to 12-months of age. The working group re-examined the role of ancillary tests in children of all ages,[A12, A13] gained advice on contemporary availability of such testing in the UK, and determined when these investigations could be used to support the diagnosis of death by neurological criteria **[Section A9]**.

d. Consideration of special preconditions

In a review of the preconditions for the diagnosis and confirmation of death using neurological criteria, the working group considered the need to have a more conservative approach to children seen post-resuscitation and/or post-hypothermia therapy, as well as those suffering abusive head trauma, genetic, metabolic, or neuromuscular diseases, or subject to certain neurosurgical procedures **[Sections A6 to A9]**.

A4. The definition of death

In the UK the presumption at the commencement of testing is that the clinical team suspects that the patient is dead. Hence the purpose of testing is to make the *'diagnosis and confirm death using neurological criteria'*. The Code takes the position that death is a unitary state in which the permanent cessation of brainstem function, whether because of cardiorespiratory arrest or devastating brain injury, will produce the permanent loss of the capacities for consciousness and for breathing. In this context, *devastating brain injury* is defined as a condition in which there is an *immediate threat to life*, *no effective treatments* of disease remain, and *early limitation of support is considered* in favour of emphasis on end of life care and comfort measures. Therefore, a diagnosis of permanent cessation of brainstem function means that the person has died and allows an authorised individual to confirm the person's death **[Table A1. The Code, Sections 2 and 3]**.

Table A1. Definition

Professional responsibilities for diagnosis and confirmation of death using neurological criteria	2025 Academy Code [Section]	2025 RCPCH update
Definition		
Death should be regarded as the permanent loss of the capacity for consciousness, combined with permanent loss of the capacity to breathe.	**2.2, 2.3, 2.4, 6.3**	**Accepted**
Neurological criteria are used in patients who remain deeply comatose, have absent brainstem reflexes and are apnoeic with their lungs being mechanically ventilated but in whom circulation and other bodily functions persist.	**6.2**	**Accepted**

A5. Approach, authorisation and responsibilities

The first objective for healthcare professionals, while establishing the cause and depth of coma in an infant or child, is to maintain life and to attempt to restore brain function. Coma can be recognised at all infant and child ages, and unresponsiveness can be evaluated and expressed on a coma scale. In cases of *devastating brain injury* there may come a point when death is suspected to have occurred. At such a time, formal assessment should be approached in an unhurried manner, to ensure that all preconditions for the diagnosis and confirmation of death using neurological criteria are met.

The criteria that authorised doctors must follow when carrying out testing, mapped to the framework used in the Code, are described in **Table A2**. For example, in each intensive care unit caring for infants and children at the time of diagnosing and confirming death using neurological criteria in children, two doctors (e.g. paediatricians and/or suitably qualified specialists) should be authorised to carry out the diagnosis; one of them must be a consultant, and both must be registered with the General Medical Council, or equivalent, for at least 5 years. There are other requirements, and it is the responsibility of the practitioner and professional organisations to maintain training and skills **[Table A2]**.

Table A2: Authorisation of doctors carrying out testing, as well as healthcare and professional organisation responsibilities

Professional responsibilities for diagnosis and confirmation of death using neurological criteria	2025 Academy Code (Section)	2025 RCPCH update
Authorisation of doctors carrying out testing		
Authorised individual who can carry out diagnosis	**2.3, 2.5, 3.2, 3.3, 3.5, 3.6**	**Accepted** The doctor is a paediatrician and/or suitably qualified specialist
At least two doctors fully registered with the General Medical Council, or equivalent, for ≥5 years	**6.6**	**Accepted**
The two doctors working together must be satisfied that all preconditions are met	**6.7**	**Accepted**
At least one of the doctors must be a consultant	**6.6**	**Accepted**
Authorised practitioner must be independent of patient organ donation	**6.6**	**Accepted**
Healthcare and professional organisation responsibilities		
Provision of necessary training for diagnosis	**3.8, 3.9**	**Accepted**
Provision of standardised documentation	**3.9**	**Accepted**

A6. Overview of the clinical diagnosis of death using neurological criteria

In the Code, neurological criteria are used when death is suspected to have occurred in patients following a devastating brain injury who remain deeply comatose, have absent brainstem reflexes and are apnoeic with their lungs being mechanically ventilated, but in whom circulation and other bodily functions persist **[the Code, 6.1 to 6.53]**. This approach to diagnosing death can also be applied confidently in infants and children.

A6.1 Preconditions for the application of neurological criteria

Table A3 is a summary of the preconditions in the Code alongside the 2025 RCPCH update.

Table A3: Preconditions

Professional responsibilities for diagnosis and confirmation of death using neurological criteria	2025 Academy Code [Section]	2025 RCPCH update
Preconditions: These must be fulfilled before two doctors can commence clinical testing		
Aetiology severe enough to cause permanent cessation of brainstem function		
Known mechanism of devastating brain injury	**6.14, 6.17**	**Accepted**
Evaluation includes neuroimaging	**6.15**	**Accepted**
Doctors are satisfied no further therapeutic options would benefit the patient	**6.16**	**Accepted**
Assessment period sufficient to exclude the potential for recovery		
Doctors must be satisfied that time will not lead to recovery or improve the patient's condition. If there is uncertainty regarding potential recovery the diagnosis cannot be made.	**6.21, 6.25**	**Accepted**
In **severe traumatic brain injury** or **spontaneous intracranial haemorrhage**, testing should not occur ≥6 hours after loss of the last observed brainstem reflex or spontaneous breath.	**6.22**	**Key difference** In <2-year-old, 24 hours of observation required **[Section A6]**

Table A3: Preconditions (cont.)

Professional responsibilities for diagnosis and confirmation of death using neurological criteria	2025 Academy Code (Section)	2025 RCPCH update
Preconditions: These must be fulfilled before two doctors can commence clinical testing		
Assessment period sufficient to exclude the potential for recovery		
In acute **hypoxic-ischaemic encephalopathy** or **post cardiac arrest**, testing should not occur until ≥24 hours after loss of the last observed brainstem reflex or spontaneous breath.	**6.23**	**Accepted [Section A6]**
In patients who are **hypothermic** (core temperature <36°C), either therapeutic or accidental, use ≥24-hour observation period following reversal of hypothermia (core temperature ≥36°C) before testing.	**6.24**	**Accepted**
Exclusion of potentially reversible factors materially contributing to the coma or apnoea		
Hypothermia: Core temperature should be ≥36°C at the time of testing, which may require active warming of the patient.	**6.27**	**Accepted**
Depressant drugs: The recent history of drug exposures will need careful review.	**6.28**	**Accepted** In all children, alterations to metabolism and excretion of drugs should be considered.
Profound neuromuscular weakness whether due to critical illness, medications (e.g. neuromuscular blocking agents), or pre-existing disorder. Peripheral nerve testing should always be used to confirm that adequate neuromuscular function is present.	**6.29**	**Accepted**

Table A3: Preconditions (cont.)

Professional responsibilities for diagnosis and confirmation of death using neurological criteria	2025 Academy Code (Section)	2025 RCPCH update
Preconditions: These must be fulfilled before two doctors can commence clinical testing		
Exclusion of potentially reversible factors materially contributing to the coma or apnoea		
If **cervical spinal cord pathology** is suspected, then imaging with CT or MRI will be needed. Where imaging demonstrates cervical spinal cord pathology, the apnoea test cannot reliably be used in isolation to demonstrate loss of the capacity to breathe and must be supplemented with an ancillary investigation. It is still however, recommended that the apnoea test be performed in cervical spinal cord pathology: if the patient breathes then the diagnosis of death using neurological criteria cannot be made; if the patient does not breathe, the diagnosis of death using neurological criteria can only be confirmed both by the absence of other brainstem reflexes and ancillary investigations.	**6.30**	**Key difference** In ≤2-year-olds, diagnosis may be supported by delaying testing and seeking expert neuro-radiological advice **[Section A7]**.
Circulatory and respiratory disturbances. The doctors undertaking the testing must be satisfied that any cardiovascular or respiratory disturbance are not materially contributing to coma or apnoea.	**6.32**	**Accepted**
Electrolyte and metabolic disturbances. The serum/plasma ranges expected before testing are: sodium 125 to 160 mmol/L; potassium >2.0 mmol/L; phosphate and magnesium 0.5 to 3.0 mmol/L; and glucose 3.0 to 20.0 mmol/L.	**6.33**	**Accepted** In children with abnormal urea, ammonia, or metabolic disorder, seek specialist advice.
Endocrine disturbances. There should be no reason to suspect an endocrine disturbance contributing to the coma or apnoea (e.g. myxoedema, thyroid storm, Addisonian crisis).	**6.34**	**Accepted**

Table A3: Preconditions (cont.)

Professional responsibilities for diagnosis and confirmation of death using neurological criteria	2025 Academy Code (Section)	2025 RCPCH update
Preconditions: These must be fulfilled before two doctors can commence clinical testing		
Additional caution for diagnosing death using neurological criteria in uncommon circumstances		
Aetiology primarily isolated to the posterior fossa or brainstem	**6.35**	**Accepted** The diagnosis of this entity in <2-year-olds is unlikely to be feasible, and it is therefore advised to delay testing and/or seek expert advice.
Therapeutic decompressive craniectomy and other conditions where cranial vault compliance may be significantly increased (e.g. severe skull fractures). In the patient who appears to meet criteria, diagnosis is supported by delaying testing and/or the addition of an ancillary investigation.	**6.36**	**Key difference** Decompressive craniectomy is not generally performed in very small children. In the context of severe skull fractures in <2-year-olds, the diagnosis may be supported by delaying testing and/or seeking expert advice **[Section A6]**.
Patients receiving therapeutic steroids to reduce brain oedema. If therapeutic corticosteroids are being used to reduce brain oedema (e.g. tumour, abscess, meningitis or trauma), the diagnosis is supported by the addition of an ancillary investigation.	**6.37**	**Key difference** In <2-year-olds, the diagnosis is supported by delaying testing and/or seeking expert advice.
Children under 2-years of age. Specific, additional criteria to the diagnosis is outlined in the 2025 RCPCH update.	**6.38**	**Accepted**

In addition to the summary in **Table A3**, the working group identified three preconditions that warranted further precaution to the preconditions before commencing clinical testing in children.

— In post-asphyxiated infants, or children aged under 2-years receiving intensive care after resuscitation, whether or not they have undergone therapeutic hypothermia, there should be a period of at least 24 hours of observation during which the preconditions necessary for the diagnosis and confirmation of death using neurological criteria should be present before clinical assessment. If there are concerns about residual drug-induced sedation, then this period of observation may need to be extended.

— In children suffering head trauma, coexistent cervical spine and cord injury is well reported. In abusive head trauma national guidelines recommend spinal MRI.[A14] In such circumstances, although an apnoea test should be performed, the diagnosis of death using neurological criteria can only be established by confirming the absence of other brainstem reflexes and seeking expert neuro-radiological advice regarding appropriate ancillary investigations **[the Code, 6.30 and 6.54 to 6.67]**.

— In children who have undergone a therapeutic decompressive craniectomy there is the potential for evolution in clinical findings. In such patients the rise in intracranial pressure and subsequent structural brain damage may be mitigated by the decompressive craniectomy. In the context of a child who appears to meet neurological criteria for death following a therapeutic decompressive craniectomy, a diagnosis of death is supported by the addition of an ancillary investigation *in those over 2-years of age,* not younger **[the Code, 6.36]**.[A18] There is a similar theoretical risk of protection against raised intracranial pressure in children with severe skull fractures resulting in loss of cranial bone integrity. In the under 2-years-olds, clinicians should delay clinical testing for a minimum of 24 hours and seek expert advice **[Section A7]**.

A6.2 Clinical tests to determine the absence of brainstem function

Details about the clinical examination can be found elsewhere in the Code **[the Code 6.39 to 6.53]** and are summarised in **Table A4**. The examination in children, irrespective of age, is the same as in adults. The clinical testing is repeated, and the prime purpose of a second examination is to minimise the possibility of an incorrect diagnosis because of error in the first examination. There is no cogent rationale for specifying a precise interval between clinical examinations in children younger than 2-years. However, in view of the importance of maximum safeguarding of the security of the diagnosis and confirmation of death in very young children with open fontanelles, a minimum period of 24 hours observation between testing should be adopted at the present time in this younger age group **[Section A7]**.

Table A4: Clinical examination

Professional responsibilities for diagnosis and confirmation of death using neurological criteria	2025 Academy Code (Section)	2025 RCPCH update
Process for the application of neurological criteria		
Tests that demonstrate the absence of brainstem function must be undertaken by the two nominated doctors. The tests are performed when there is a strong suspicion that death has occurred and after consideration of the preconditions.	**6.39**	**Accepted**
The clinical evaluation to exclude brainstem function test involve cranial nerve brainstem reflexes and the apnoea test. These comprise one set of clinical tests.	**6.40**	**Accepted**
Two sets of tests must be performed. Sometimes, ancillary investigation may be required to support the diagnosis.	**6.40**	**Accepted**
Families should be allowed to observe a set of clinical tests to confirm death. Often, the second set of tests is the most appropriate and useful for families to witness.	**6.9, 6.19**	**Accepted**
Steps in the process for neurological criteria		
Clinical testing of cranial nerve (CN) brainstem reflexes		
An adequate bilateral stimulus should be applied. Since the eyes are used in three of the six brainstem reflexes, it must be possible to examine both eyes and there must be no reason to suspect an eye injury. Where there is an inability to examine either eye, ancillary investigation will be required to support a diagnosis of death using neurological criteria. Similarly, both ears must be able to be accessed for the vestibulo-ocular reflex.	**6.42**	**Key difference** In infants and very young children, the diagnosis may be supported by delaying testing and/or seeking expert advice **[Section A6]**
Specific brainstem reflexes		
Pupillary reflex (CN II, III). Pupils fixed in midsize or dilated position, non-reactive to light. Test for direct and consensual response on both sides.	**6.43**	**Accepted**
Corneal reflex (CN V, VII). No eyelid movement when each cornea is touched.	**6.43**	**Accepted**
Vestibulo-ocular reflex (CN III, IV, VI, VIII). No eye movements should be seen during slow injection of at least 50 mL (20-50 mL for a child) of ice-cold water over 1 minute into each external auditory meatus in turn.	**6.43**	**Accepted**

Table A4: Clinical examination (cont.)

Professional responsibilities for diagnosis and confirmation of death using neurological criteria	2025 Academy Code (Section)	2025 RCPCH update
Specific brainstem reflexes		
Motor response (CN V, VII). No motor response within the CN or somatic distribution in response to supraorbital pressure (performed on both sides).	**6.19, 6.43**	**Accepted**
Gag reflex (CN IX, X). No gag reflex to stimulation of the posterior pharynx.	**6.43**	**Accepted**
Cough reflex (CN X). No cough reflex to bronchial stimulation by catheter in trachea at carina.	**6.43**	**Accepted**
The apnoea test		
Starting $PaCO_2$ ≥5.3 kPa; observe for ≥5 minutes; and at the end confirm $PaCO_2$ ≥8.0 kPa (rise of ≥2.7 kPa), and pH <7.3.	**6.46**	**Accepted [Table A6]**
Repetition of clinical tests		
Perform the tests twice. If the first set of clinical tests shows no evidence of brainstem function, there need not be a lengthy delay prior to performing the second set.	**6.49, 6.50**	**Key difference** Minimum 24 hour interval in <2-year-olds
Death is confirmed at the time of completion of the second set of clinical tests. This becomes the time of death.	**6.51, 6.52**	**Accepted**

Users of this update will notice that there are differences between the 2008 Academy Code[A1], the 2015 RCPCH report,[A2] and the Code. For example, the change in temperature to define normothermia from ≥35°C to ≥36°C **[Table A3]**. There are also new differences between criteria used for testing between young infants and adults. In general, these changes should be seen as an attempt to minimise differences in guidance between the 2008 Academy Code[A1] and the 2015 RCPCH report,[A3] and between the approaches to clinical tests of brainstem function described in international guidelines published during 2020 to 2023.[A3-A6] These changes must not be interpreted as representing an alteration in the validity of previous diagnoses of death using neurological criteria in infants, children, and adolescents. Rather, they are a reasoned approach to removing unnecessary complexity and difference with multiple thresholds in age, temperature, arterial partial pressure of carbon dioxide ($PaCO_2$), and testing intervals that exist around the world **[Section A8]**. While these previous differences between jurisdictions do not impact prior diagnoses, the emphasis of the 2025 RCPCH working group was to seek simplification and consistency.

A7. Age and the developmental perspective

A7.1 Lower gestational age limit

In the UK, since the 2015 RCPCH report[A2], it is now accepted that the lower limit for a diagnosis and confirmation of death using neurological criteria is 37-weeks' gestation. Since there is some variance in the wording used in the literature **[Section A11]**, the working group considered that further clarification was needed about this definition.

The lower **gestational age at which the diagnosis and confirmation of death using neurological criteria can be made is 37-weeks + 0-days** after the date of the mother's last menstrual period. This is considered term gestation. In premature babies born <37-weeks, age is corrected for prematurity ['corrected age'].

A7.2 Cranial vault development

The developmental fusing of cranial vault sutures and the closing of the anterior fontanelle may influence the vulnerability of brainstem function in infants and young children with devastating brain injury.[A6]

The anterior fontanelle usually closes between 13- and 24-months [corrected gestation] but may be delayed in certain genetic or metabolic conditions.[A8, A9] In such cases, the distensibility of the dura and cranial vault may protect brainstem function when there is devastating brain injury and cerebral oedema.[A10, A11] This pattern of pathophysiology means that to maximise safeguarding the security of diagnosing and confirming death using neurological criteria in children, the before and between clinical testing in infants and young children under 2-years-old should be longer to that used in older children and adults. Therefore, a minimum period of 24 hours should occur prior to and between clinical testing in young children under 2-years-old.

A7.3 Transition age limit

In the RCPCH 2015 report[A2] the age at which an infant transitioned to undergoing the same criteria for the diagnosis and confirmation of death using neurological criteria as adults was defined as 2-months post term. In the contemporary literature the range in ages includes: >38-weeks' gestation; 1-, 2-, and 3-months; and 1- and 2-years [A3-A6] **[Section A11]**.

The working group reviewed age- and development-related aspects of the diagnosis and confirmation of death using neurological criteria, and the need to not only consider international guidance, but also to have a straightforward approach to diagnosis. For example, the working group wanted to avoid, if possible, having different reference ages for clinical assessment and ancillary investigation. As a pragmatic solution, taking together all the available evidence, the working group concluded that the **age of ≥24-months** (2-year corrected age for children born prematurely) is the age when a child can undergo clinical assessment for the diagnosis and confirmation of death by neurological criteria using the same criteria determined applicable to adults. This cautious approach aims to ensure maximum safeguarding of the security of the diagnosis and confirmation of death using neurological criteria in very young children.

A8. Apnoea test

In the 2015 RCPCH report[A2] the working group recommended a stronger hypercarbic stimulus to establish brainstem respiratory unresponsiveness in infants older than 37-weeks' gestation (post menstrual) to 2-months post term. Specifically, there should be a clear rise in the level of $PaCO_2$ by at least 2.7 kPa (>20 mmHg) above a baseline of at least 5.3 kPa (40 mmHg) to at least 8.0 kPa (60 mmHg) with no respiratory response at that level. At the time, these criteria differed from the 2008 Code recommended in infants older than 2-months post term.[A1]

International guidelines from 2020, 2021 and 2023 remain consistent with the 2015 RCPCH report in that the hypercarbic stimulus used in young infants is applied to apnoea testing in all children.[A3-A6] The working group considered all the evidence about pH, absolute rise in $PaCO_2$, and duration of hypercarbic exposure **[Table A5]**.

The working group also reviewed seven case reports (1991 to 2019) in children aged 3-months to 15-years,[A19-A25] with four aged 3-months, in which the authors questioned the validity of using a threshold in $PaCO_2$ ≥8 kPa (≥60 mmHg) as an adequate hypercarbic respiratory stimulus. These data were reviewed by the working group and found not to be supportive of a change in the level of hypercarbic stimulus required for the apnoea test used in this RCPCH update.

A8.1. Apnoea test criteria

The Code apnoea test criteria – which are similar to the 2015 RCPCH report criteria[A2] – should be used in any infant, child, or adolescent, irrespective of age. In common with other jurisdictions, a pH criterion is added to the ending criteria of the apnoea test **[Table A5]**.

In children with chronic CO_2 retention (e.g. bronchopulmonary dysplasia and cystic fibrosis) a rise of 2.7 kPa (>20 mmHg) should also be used in the apnoea test. The pH criterion at the end of the test ensures that chronic respiratory alkalosis has been excluded. Therefore, the 2025 RCPCH update to the apnoea test is:

- $PaCO_2$ equal or greater than 5.3 kPa at the start of the apnoea test
- A minimum of 5 minutes of apnoea during testing
- At the end of the test, the criteria that need to be confirmed are: $PaCO_2$ ≥8 kPa, with a rise of ≥2.7 kPa from baseline; and arterial pH <7.3 (or $[H^+]$ >50 nmol/L)

A8.2. Interval between apnoea testing

Two apnoea tests are required to diagnose and confirm death using neurological criteria **[Table A4]**. In children older than 2-years, no delay is required as long as the patient's blood gases and baseline parameters have returned to appropriate pre-test levels.

The 2015 RCPCH report[A2] recommended that in infants older than 37-weeks' gestation (post menstrual) to 2-months post term, repeat apnoea testing (i.e. the interval before the second set of clinical testing) "need not be prolonged". At that time, the report supported the view that the prime purpose of the second examination (including the apnoea test) is "to minimize [sic] the possibility of an incorrect diagnosis because of error in the first examination." Since "no cogent rationale for specifying a precise interval between clinical examinations" could be found, the conclusion in the 2015 RCPCH report was that "an appropriate period" of observation and assessment of preconditions before testing should be specified.

The working group considered other international guidance, the potential influence of an open fontanelle on pattern of physiology, and the need to maximise safeguarding the security of the diagnosis. The 2025 RCPCH update is that in the under 2-year-olds (from 37-weeks' corrected gestation, post menstrual, to 2-years post term), as opposed to those aged 2-years to adults, the interval between tests should be a minimum of 24 hours.

Table A5. Summary of apnoea test criteria presented in 2020-2023 literature along with the updated Academy Code and RCPCH Appendix

Report	Apnoea testing in those without chronic hypercapnia					
	Age category	Start $PaCO_2$ ± pH	Rise in $PaCO_2$	End $PaCO_2$ ± pH	Duration of apnoea	Interval between apnoea test
2020: The World Brain Death Project [A3]	36-weeks to 30-days	4.7 to 6.0 kPa (35-45 mmHg)	Unspecified	≥8.0 kPa (≥60 mmHg) pH <7.30	Check at 10 minutes	Not applicable (only one test required)
	>30-days	4.7 to 6.0 kPa (35-45 mmHg)	Unspecified	≥8.0 kPa (≥60 mmHg) pH <7.30	Check at 10 minutes	Not applicable (only one test required)

Table A5. Summary of apnoea test criteria presented in 2020-2023 literature along with the updated Academy Code and RCPCH Appendix (cont.)

Report	Apnoea testing in those without chronic hypercapnia					
	Age category	Start $PaCO_2$ ± pH	Rise in $PaCO_2$	End $PaCO_2$ ± pH	Duration of apnoea	Interval between apnoea test
2021: Australia and New Zealand[A4]	37-weeks to 30-days	Unspecified Option: 6.0 kPa (45 mmHg)	Unspecified	>8.0 kPa (>60 mmHg) pH <7.30	Check at 10 minutes	24 hours
	>30-days	Unspecified Option: 6.0 kPa (45 mmHg)	Unspecified	>8.0 kPa (>60 mmHg) pH <7.30	Check at 10 minutes	No set interval
2023: Canada Medical Association[A5]	37-weeks to <2-months	Unspecified	>2.7 kPa (>20 mmHg)	≥8.0 kPa (≥60 mmHg) pH ≤7.28	Unspecified	>24 hours
	2-months to <1-year	Unspecified	>2.7 kPa (>20 mmHg)	≥8.0 kPa (≥60 mmHg) pH ≤7.28	Unspecified	'Separation in time recommended'
	1- to 18-years	Unspecified	>2.7 kPa (>20 mmHg)	≥8.0 kPa (≥60 mmHg) pH ≤7.28	Unspecified	In most provinces one test used, except for organ donation

Table A5. Summary of apnoea test criteria presented in 2020-2023 literature along with the updated Academy Code and RCPCH Appendix (cont.)

Report	Apnoea testing in those without chronic hypercapnia					
	Age category	Start $PaCO_2$ ± pH	Rise in $PaCO_2$	End $PaCO_2$ ± pH	Duration of apnoea	Interval between apnoea test
2023: American Academies of Neurology and Pediatrics[A6]	37-weeks to <24-months	4.7 to 6.0 kPa (35-45 mmHg) pH 7.35 to 7.45	≥2.7 kPa (≥20 mmHg)	≥8.0 kPa (≥60 mmHg) pH <7.30	Check after 8-10 minutes	12 hours
	24-months to 18-years	4.7 to 6.0 kPa (35-45 mmHg) pH 7.35 to 7.45	≥2.7 kPa (≥20 mmHg)	≥8.0 kPa (≥60 mmHg) pH <7.30	Check after 8-10 minutes	12 hours 'in children'
2025: Academy and RCPCH	37-weeks to <24-months	≥5.3 kPa (≥40 mmHg)	≥2.7 kPa (≥20 mmHg)	≥8.0 kPa (≥60 mmHg) pH <7.30	≥5 minutes	At least 24 hours
	24-months to 18-years (as adults)	≥5.3 kPa (≥40 mmHg)	≥2.7 kPa (≥20 mmHg)	≥8.0 kPa (≥60 mmHg) pH <7.30	≥5 minutes	Need not be prolonged

A9. Ancillary investigations

In the UK, ancillary investigation refers to neuroradiological and nuclear medicine imaging of cerebral blood flow and perfusion **[the Code, 6.54 to 6.67]**.

The 2015 RCPCH report concluded that electroencephalography or studies of cerebral blood flow and perfusion are not required for the diagnosis and confirmation of death using neurological criteria in infants from 37-weeks' corrected gestation (post menstrual) to 2-months post term.[A2] At that time, further review indicated that there was little evidence about ancillary tests in under 1-year-old infants. The 2015 report therefore concluded that when the clinical examination could not be used to diagnose and confirm death by neurological criteria, ancillary investigations (whether electroencephalography or brain nuclear medicine imaging) should not be used to support the diagnosis.

The working group re-examined the evidence and role of ancillary tests in children of all ages,[A3-A6, A12, A13] gained advice on contemporary availability of such testing in the UK from its experts in the field, and determined when these investigations could be used to support the diagnosis of death using neurological criteria **[Section A11]**.

At this time, there is no consensus as to which imaging ancillary investigation can be recommended in infants and children. Of the investigations available, which could be used to support the diagnosis and confirmation of death using neurological criteria, we have in UK paediatric practice:

— Cranial computed tomography angiography (CTA) and brain magnetic resonance imaging angiography (MRA)
These techniques demonstrate the delivery of contrast or the presence of flowing blood in the intracranial arterial tree and are investigations which, when performed to a strict protocol, have a high diagnostic performance in adults against the gold standard of clinical testing. However, diagnostic sensitivity is low in patients with open fontanelles.[A26] In addition, experience in the NHS in the context of diagnosing and confirming death using neurological criteria in children, especially very young children when a clinical examination is not possible, is limited. Therefore, until further recommendations become available these investigations are for specialist centres in older children.

— Radionuclide imaging of brain perfusion using 99mTc HMPAO-SPECT
This technique quantifies tissue perfusion although its reliability in assessing small structures is questionable. It is an ancillary investigation that may support the diagnosis of death using neurological criteria in children, but there is a question

about diagnostic certainty in the evaluation, especially in younger children with open fontanelles.[A10-A13] Furthermore, experience in the NHS is limited and until further recommendations become available this is an investigation for specialist centres in the child aged older than 24-months.

Taking all the above together, when the clinical examination cannot be completed or where there are confounding factors, it may not be possible to use ancillary investigations to support a diagnosis of death using neurological criteria in young children. Furthermore, due to the presence of an open fontanelle, diagnostic uncertainty of the modality, as well as the paucity of experience, the 2025 RCPCH update does not recommend the use of ancillary investigations to support the diagnosis of death using neurological criteria in infants or children aged less than 2-years of age **[Table A6]**.

Table A6. Ancillary investigations

Professional responsibilities for diagnosis and confirmation of death using neurological criteria	2025 Academy Code (Section)	2025 RCPCH update
When ancillary tests are required		
When comprehensive examination, including apnoea test is not possible (e.g. high cervical cord pathology, inability to examine both eyes or both ears)	**6.30, 6.36, 6.48, 6.54, 6.64**	**Accepted in children ≥24-months** but *not* in infants and very young children, where instead the diagnosis may be supported by delaying testing and/or seeking expert advice
When confounding factors which affect preconditions cannot be excluded (e.g. residual sedation, metabolic or pharmacological derangement, decompressive craniectomy)	**6.28, 6.33, 6.36, 6.54, 6.64**	**Accepted in children ≥24-months** but *not* in infants and very young children, where instead the diagnosis may be supported by delaying testing and/or seeking expert advice
When there is uncertainty regarding presumed non-brain mediated movements	**6.19, 6.65**	**Accepted in children ≥24-months** but *not* in infants and very young children, where instead the diagnosis may be supported by delaying testing and/or seeking expert advice
When there has been therapeutic decompressive craniectomy or other condition where cranial capacity is increased (e.g. multiple skull fractures)	**6.36**	**Accepted in children ≥24-months** but *not* in infants and very young children, where instead the diagnosis may be supported by delaying testing and/or seeking expert advice

Table A6. Ancillary investigations (cont.)

Professional responsibilities for diagnosis and confirmation of death using neurological criteria	2025 Academy Code (Section)	2025 RCPCH update
When ancillary tests are required		
When therapeutic corticosteroids are being used to reduce brain oedema (e.g. tumour, abscess, meningitis or trauma)	**6.37**	**Accepted in children ≥24-months** but *not* in infants and very young children, where instead the diagnosis may be supported by delaying testing and/or seeking expert advice
When the aetiology is primarily isolated to the posterior fossa or brainstem	**6.35**	**Accepted in children >24-months.** However, this diagnosis in <2-year-olds is unlikely to be feasible, and it is therefore advised to delay testing and/or seek expert advice
When there is need to promote understanding in families	**6.66**	**Key difference** May be considered in older children/adolescents

A10. Concluding comments

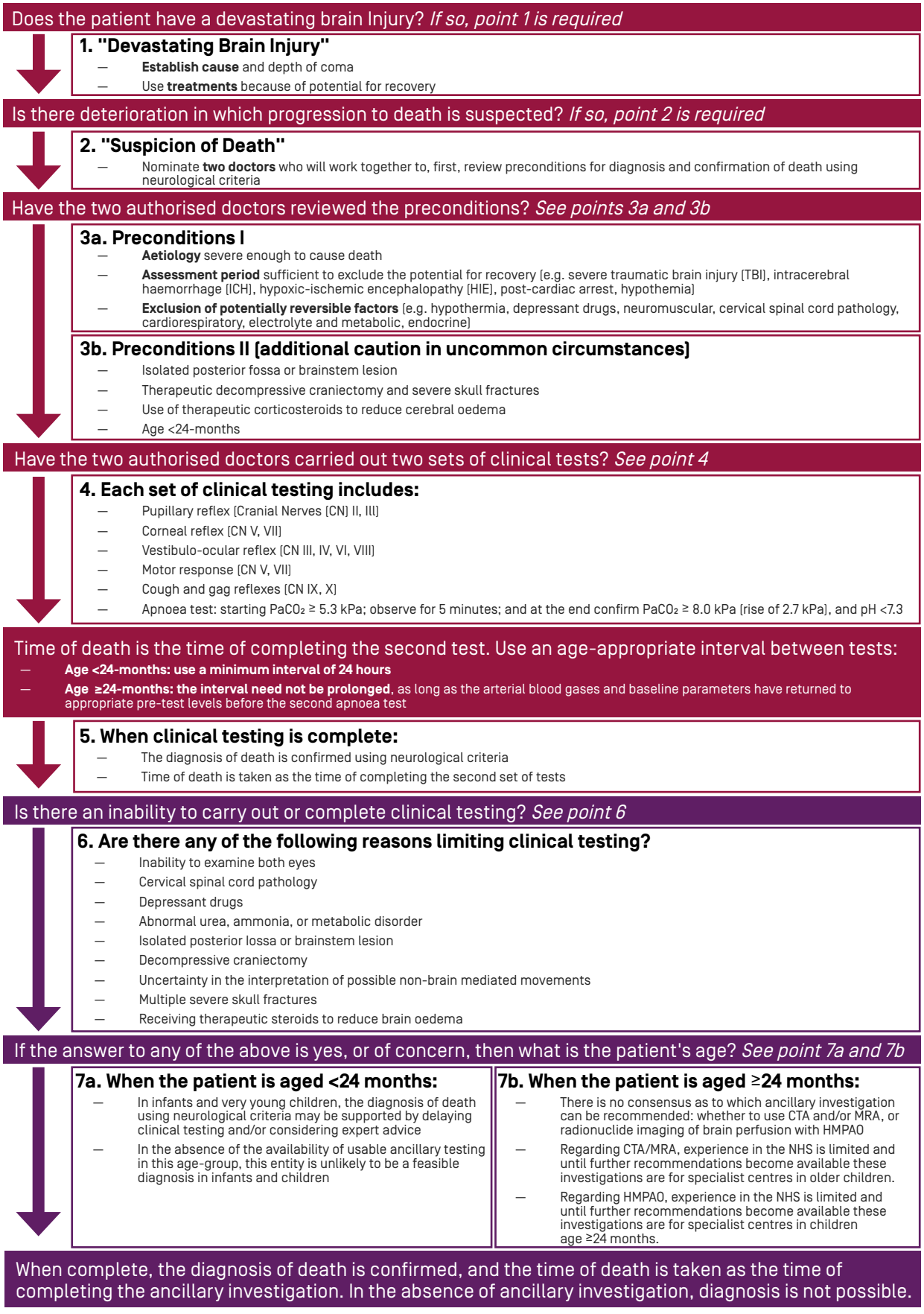
The diagnosis and confirmation of death using neurological criteria is an infrequent event in paediatric and neonatal intensive care units in the UK. The working group has taken the view that maximum safeguarding of the security of the diagnosis and confirmation of death using neurological criteria in children is paramount, and one of five guiding principles **[Section A1]**.

Figure A2 summarises the 2025 RCPCH update for the diagnosis and confirmation of death using neurological criteria in a critically ill infant or child, from admission to an intensive care unit with devastating brain injury and suspicion that death has occurred during mechanical ventilation, through to the diagnosis of death using neurological criteria based on clinical testing or with the addition of ancillary investigations.

Users of the Code, as well as this 2025 RCPCH update will notice that there are differences between the 2008 Academy Code[A1], the 2015 RCPCH report,[A2] and the 2025 documents **[Tables A1 to A8 and Figure A3]**. There are also new differences between criteria used for testing between young infants and adults. In general, these changes are an attempt to reduce unwarranted variations in UK and International practice.[A3-A6] These changes must not be interpreted as representing an alteration in the validity of previous diagnoses of death using neurological criteria in infants, children, and adolescents. Rather, they are a reasoned approach to removing unnecessary complexity and difference with multiple thresholds in age, temperature, $PaCO_2$, and testing intervals that exist around the world. That is, these previous differences between jurisdictions do not impact prior diagnoses; the emphasis of the working group is to seek simplification and consistency.

In conclusion, the 2025 RCPCH update unequivocally supports the Code definition of death, the diagnosis and confirmation of death using neurological criteria, and the processes involved in making this diagnosis and communicating with bereaved parents and families. A nuance particular to the update is that there are certain caveats to the diagnosis and confirmation of death using neurological criteria in infants aged under 2-years when clinical testing is not possible, or incomplete. That is, in view of the importance of maximum safeguarding of infants and very young children, the diagnosis may be supported by delaying testing and/or seeking additional expert advice.

Figure A2. A summary algorithm as an approach to assessment of the child with devastating brain injury



A11. Additional figure and tables

The additional summary Figures and Tables include:

- Figure A3, a summary of changes between 2008, 2015 and 2025 documents
- Table A7, a summary of age-transitions used in international reports
- Table A8, a summary of ancillary investigations used, by age category, across the world.

Figure A3: Changes in the 2025 Academy Code and 2025 RCPCH update compared with the 2015 RCPCH and 2008 Academy reports

Definition of death (all ages)

The Code now uses the term 'permanent' rather than the word 'irreversible' that was in the 2008 Academy Code, when defining death. That is, when describing the loss of functions that need to have occurred to diagnose and confirm death the new Code states, "permanent loss of the capacity for consciousness, combined with permanent loss of the capacity to breathe" and the "permanent cessation of brainstem function".

Preconditions

Body temperature

The Code adopts a minimum core temperature of 36°C. The 2015 RCPCH report[A2] states a minimum of 34°C, which is what the 2008 Academy Code recommended.[A1]

Electrolytes

Check all electrolyte levels. For example, the Code adopts a minimum sodium concentration as a precondition for testing of 125 mmol/L, which is an increase from 115 mmol/L in the 2008 Academy Code.[A1]

Clinical examination

Eye and ear examination

There has been a change from the 2008 Academy Code[A1] with an emphasis on the eye examination. That is, given that the eyes are required in the clinical testing of three of the six brainstem reflexes used in neurological criteria, the recommendation in the Code is that it must be possible to examine both eyes and there must be no reason to suspect an eye injury or abnormality which would prevent the reflex occurring if it could. Similarly, both ears must be able to be accessed for the vestibulo-ocular reflex. That is, in the case of an inability to examine either eye or ear, for whatever reason, it is recommended that ancillary investigation would be required to support a diagnosis of death using neurological criteria. **This new requirement has implications given the age that ancillary testing is valid and feasible in the UK.**

Figure A3: Changes in the 2025 Academy Code and RCPCH Appendix compared with the 2015 RCPCH and 2008 Academy reports (cont.)

Apnoea test

There are changes to the apnoea test criteria:

a. *In the older than 2-month-olds* there are changes from the starting $PaCO_2$ ≥ 5.3 kPa; the minimum duration of apnoea is 5 minutes; the rise in $PaCO_2$ during the apnoea test ≥ 2.7 kPa; and, the ending $PaCO_2$ ≥ 8.0 kPa, with pH <7.3.

b. *In the under 2-month-olds* the only change from the 2015 RCPCH report is that an ending pH <7.3 is also required.

Interval between clinical tests

There are changes to the Code, compared with the 2008 Academy Code[A1] in the interval between apnoea testing:

a. *In children aged 2-months (post menstrual) to 2-years corrected age post term*: the diagnosis of death using neurological criteria can be confidently made by following the Code provided the interval between the two sets of clinical tests is a minimum of 24 hours.

Ancillary investigations

In the 2015 RCPCH report,[A2] the College was asked whether death using neurological criteria could be confidently diagnosed and confirmed in infants aged under 2-months (post menstrual, corrected age). The section concerning supporting such a diagnosis with ancillary investigations found that because of false positives and false negatives such a diagnosis was not secure. Therefore, the conclusion was that the diagnosis and confirmation of death using neurological criteria could not be supported by ancillary investigations when any component of clinical testing could not be completed.

a. The evidence reviewed in the 2015 RCPCH report was very clear that the data were limited up to 1-year of age, with false positives and false negatives.

b. The position in 2025 is that the UK experience of using these investigations for supporting the diagnosis of death in the NHS is extremely limited in under 2-year-olds.

Time of death (all ages)

The Code recommends that time of death is confirmed using neurological criteria at the time of completion of the second set of clinical tests.

a. This new time of death is a change to the 2008 Academy Code.[A1]

b. In the 2015 RCPCH report,[A2] the time at the end of the apnoea test in the first set of tests is taken as the time of death, which is consistent with the 2008 Academy Code[A1], but now different to the Code.

Table A7: Age transition criteria across different jurisdictions

Country	Lower age transition	Interval age transition	Upper age transition (at which testing as per adult criteria)
The World Brain Death Project (2020)[A3]	36-weeks gestation	N/A	30-days
Australia and New Zealand (2021)[A4]	37-weeks gestation	N/A	30-days
Canada Medical Association (2023)[A5]	37-weeks gestation	2-months	1-year
American Academies of Neurology and Pediatrics (2023)[A6]	37-weeks gestation	N/A	2-years
Academy Code and RCPCH update (2025)	37-weeks gestation	N/A	2-years

Table A8: Summary of use of ancillary investigations to support the diagnosis of death by neurological criteria reported in recent international guidelines, 2020-2023

Country, year, reference	Age category	Ancillary Investigation
The World Brain Death Project (2020)[A3]	36-weeks to 30-days	Not recommended
	>30-days	**If indicated**: 4-vessel angiography, radionuclide perfusion studies and electroencephalography (EEG) recommended. CT angiography (CTA), MR spectroscopy are not recommended
Australia and New Zealand (2021)[A4]	37-weeks to 30-days	Not mandated. **If indicated**: recommendations as below.
	>30-days	Not mandated. **If indicated**: 4-vessel angiography and radionuclide SPECT imaging recommended. Subject to guidelines CTA may be acceptable. MRI not recommended.
Canada Medical Association (2023)[A5]	37-weeks to <2-months	Not recommended
	2-months to <1-year	Not mandated. **If indicated**: recommendations as below.
	1-year to 18-years	Not mandated. **If indicated**: radionuclide perfusion study using lipophilic agent, e.g. 99mTc-HMPAO (or radionuclide brain flow study using lipophobic agent when lipophilic agent not available) recommended. EEG, CTA, 4-vessel angiography not recommended.

Table A8: Summary of use of ancillary investigations to support the diagnosis of death by neurological criteria reported in recent international guidelines, 2020-2023 (cont.)

Country, year, reference	Age category	Ancillary Investigation
American Academies of Neurology and Pediatrics (2023)[A6]	37-weeks to ~<24-months	Not mandated. **If indicated**: recommendations as below.
	24-months to 18-years	Not mandated. **If indicated**: 4-vessel cerebral angiography, radionuclide angiography, or radionuclide perfusion scintigraphy [Tc99m HMPAO lipophilic soluble agent] for perfusion, or SPECT imaging for visualisation of posterior fossa structures and delayed planar imaging to demonstrate flow/perfusion]. Use lipophobic agents when lipophilic agents not available. EEG, CTA and MRA are not recommended.
Academy Code and RCPCH update (2025)	37-weeks to <24-months	Not recommended due to concerns about open fontanelle and unfused cranial sutures.
	24-months to 18-years (as adults)	Not mandated. **If indicated**: no clear consensus as to which investigation should be performed. Radionuclide SPECT perfusion study with lipophilic agent, cranial CTA, and MRA may be carried out in older children in specialist centres. In adults '4 point' CTA recommended (by UK multi-professional consensus protocol, 2023[A18])

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Acknowledgements

The working group thanks all contributors in the development of the 2025 RCPCH update on the diagnosis of death using neurological criteria in infants, children, and adolescents.

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