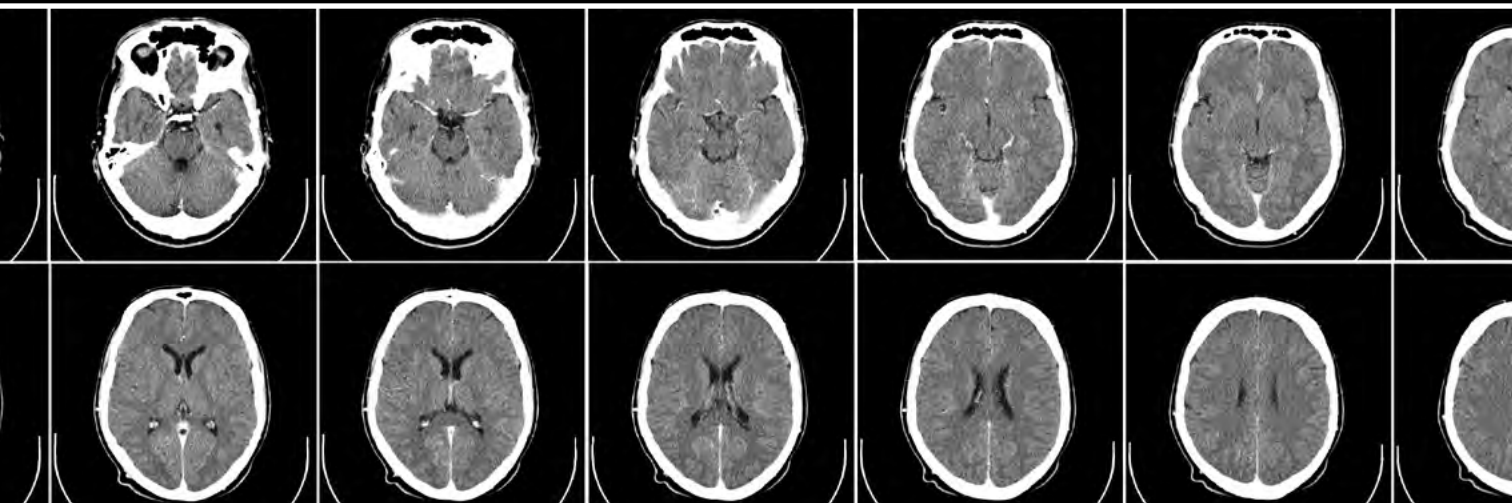


# Additional FICMPAS Guidance for Decompressive Craniectomy and Diagnosing Death using Neurological Criteria (DNC)



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Some clinicians have asked for additional guidance in this specific circumstance. We suggest that until further evidence becomes available to guide practice, the diagnosis of DNC in patients who have undergone a therapeutic decompressive craniectomy can be supported by the demonstration of absence of intracranial blood flow, for example, by CT angiogram.



## References

1. <https://www.ficm.ac.uk/diagnosing-death-using-neurological-criteria>
2. Taylor T, Dineen RA, Gardiner DC, Buss CH, Howatson A, Chuzhanova NA & Pace NL. (2014) "Computed tomography (CT) angiography for confirmation of the clinical diagnosis of brain death." Cochrane Database Syst Rev Mar 31;3:CD009694. doi: 10.1002/14651858.CD009694.pub2.

Data from the potential donor audit (PDA) shows that death is confirmed using neurological criteria in approximately 1,700 persons per annum in the United Kingdom. The PDA also suggests that each year, on average DNC is only confirmed in 5–10 patients who have undergone a therapeutic decompressive craniectomy (0.3–0.6% of all DNC determinations). Few intensivists will have significant experience of confirming DNC in the presence of therapeutic decompressive craniectomy. This limited experience in confirming DNC in the presence of therapeutic decompressive craniectomy is not surprising given that the procedure has only re-emerged as a therapeutic option in recent years. Also, it is likely that these cases will be seen almost exclusively in neuro-intensive care units.

Following a case in the United Kingdom in early 2021 where a patient who had undergone bilateral therapeutic decompressive craniectomies and diagnosed DNC using clinical criteria but went on to start breathing and regain consciousness, an expert group reviewed the case in detail. The group recommended that decompressive craniectomy should be added to the list of Red Flag patient groups on the FICM and ICS endorsed Forms for the Diagnosis of Death using Neurological Criteria. This recommendation was accepted by both organisations and added to the updated version of the forms.

Red Flag groups are those that have been identified in the literature or from clinical experience as cases where irreversibility of the apnoea and coma is more difficult to establish.

## Red Flags

The list of Red Flags which appear on the nationally endorsed testing forms<sup>1</sup> are:

1. Testing < 6 hours of the loss of the last brain-stem reflex
2. Testing < 24 hours of the loss of the last brain-stem reflex, where aetiology primarily anoxic damage
3. Hypothermia, 24 hour observation period following re-warming to normothermia recommended
4. Patients with any neuromuscular disorders
5. Steroids given in space occupying lesions such as abscesses
6. Prolonged fentanyl infusions
7. Aetiology primarily located to the brain-stem or posterior fossa
8. Therapeutic decompressive craniectomy

## Approaches

There are four approaches to consider in the presence of **any** red flag situation before confirming death using neurological criteria:

1. Delay testing and give more time if this will resolve the red flag concern
2. Consider the use of drug antagonists or measure plasma levels of sedatives, if this will resolve the red flag concern
3. Carry out an ancillary investigation, which should be considered additional to the fullest clinical testing and examination carried out to the best of the two doctors' capabilities in the given circumstances
4. Conclude it is not safe to make the diagnosis of death using neurological criteria, which may lead to a decision to withdraw life sustaining treatment.

## Therapeutic decompressive craniectomy

In the context of a patient who appears to meet the criteria for DNC following a therapeutic decompressive craniectomy we suggest that clinical tests can be supported by the use of an ancillary investigation. Most ancillary tests either confirm the absence of cerebral blood flow or of neurophysiological activity. The investigation undertaken depends on local availability of the test and access to expertise to interpret the result. It is also dependent on the sensitivity and specificity of the test in confirming the diagnosis.

Types of ancillary investigations which have been used to confirm absence of cerebral blood flow include CT angiography, persisting measurement of Intra Cranial Pressure greater than Mean Arterial Pressure (ICP > MAP), 4 vessel angiography, transcranial doppler, MR angiography and positron emission tomography.

In the UK the ancillary test that is most widely available in hospitals (not just neuro centres) is likely to be CT angiography. It is recognised that some intracranial vessel opacification is present in approximately 15% of patients who are confirmed DNC<sup>2</sup>. However, in cases where CT angiography (or any other ancillary investigation) is used to exclude confounders, such as is the case in therapeutic decompressive craniectomy, absence of intracranial flow is necessary to confirm DNC.

A FICM working group is currently collaborating with the British Society of Neuroradiologists to create a standardised protocol for CT angiography when used as an ancillary investigation for DNC.