

# Brain Stem Death

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## **Abstract**

*The definition of death lost its significance in favor of brain death. Brain death is a permanent cessation of all functions of the brain in which though individual organs may function but lack of integrating function of the brain, lack of respiratory drive, consciousness, and cognition confirms to the definition that death is an irreversible cessation of functioning of the organism as a whole. In spite of medical and legal acceptance globally, the concept of brain death and brain-stem death is still unclear to many. Brain death is not promptly declared due to lack of awareness and doubts about the legal procedure of certification. Many brain-dead patients are kept on life supporting systems needlessly. An attempt has been made to highlight the history and concept of brain death and brain-stem death; the anatomical and physiological basis of brain-stem death, and criteria to diagnose brain-stem death in India.*

**Key words:** *Brain Death, Determining the patient is brain dead or no*

## **Introduction**

In the practice of critical care, 'the care of a severely injured brain patient' is one of the toughest challenges for a critical care physician. Initial therapy provided for patients with severe brain injury or insult, is directed towards preservation and restoration of neuronal function <sup>(1)</sup>. When this primary treatment is unsuccessful and the patient's condition evolves to brain death, the critical care physician has the responsibility to diagnose brain death with certainty and to offer the patient's family the opportunity to donate organs and / or tissues.

## **Evolution of the criteria for brain death**

Historically death was defined by the presence of putrefaction or decapitation, failure to respond to painful stimuli, or the apparent loss of observable cardio respiratory action. The widespread use of mechanical ventilators that prevent respiratory arrest has transformed the course of terminal neurologic disorders<sup>(3)</sup>. Vital functions can now be maintained artificially after the brain has ceased to function.

**Definition:**

Brain death is defined as the irreversible loss of all functions of the brain, including the brainstem. The three essential findings in brain death are coma, absence of brainstem reflexes, and aponia. An evaluation for brain death should be considered in patients who have suffered a massive, irreversible brain injury of identifiable cause. A patient determined to be brain dead is legally and clinically dead.

**Determination of brain death:**

Identification of history or physical examination findings that provide a clear etiology of brain dysfunction. The determination of brain death requires the identification of the proximate cause and irreversibility of coma. Severe head injury, hypertensive intracerebral hemorrhage, aneurysmal subarachnoid hemorrhage, hypoxic-ischemic brain insults and fulminant hepatic failure are potential causes of irreversible loss of brain function. The evaluation of a potentially irreversible coma should include, as may be appropriate to the particular case; clinical or neuro-imaging evidence of an acute CNS catastrophe that is compatible with the clinical diagnosis of brain death; Exclusion of any condition that might confound the subsequent examination of cortical or brain stem function.

**Clinical observations compatible with the diagnosis of brain death:**

The following manifestations are occasionally seen and should not be misinterpreted as evidence for brainstem function:

- i. spontaneous movements of limbs other than pathologic flexion or extension response
- ii. respiratory-like movements (shoulder elevation and adduction, back arching, intercostal expansion without significant tidal volumes)
- iii. sweating, flushing, tachycardia
- iv. normal blood pressure without pharmacologic support or sudden increases in blood pressure
- v. absence of diabetes insipidus
- vi. deep tendon reflexes; superficial abdominal reflexes; triple flexion response<sup>(4)</sup>

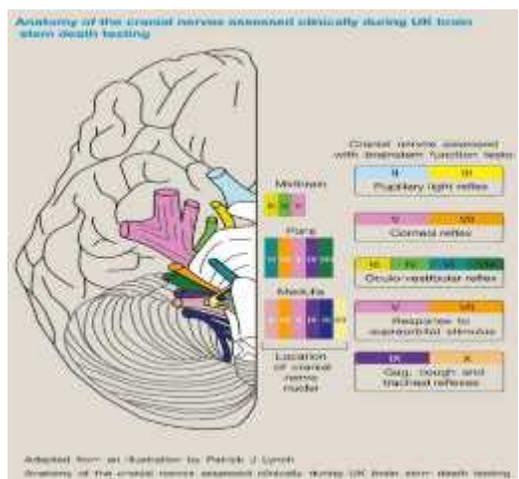


Fig 1: Depicting the anatomy of cranial nerves assessed clinically during UK brain stem death testing

## **Responsibilities of Physicians Determining Brain death:**

### ***Notify Next of Kin:***

The facility must make diligent efforts to notify the person closest to the patient that the process for determining brain death is underway. Consent need not be obtained but requests for reasonable accommodation based on religious or moral objections should be noted and referred to appropriate hospital staff <sup>[2]</sup>. Where family members object to invasive confirmatory tests, physicians should rely on the guidance of hospital counsel and the ethics committee.

### **Indian Context:**

Awareness about brain-death is extremely low in India. <sup>[5][6][7]</sup>. Various aspects of brain-death importance for organ donation and its legality needs to be elaborated. India follows the UK concept of to be elaborated. India follows the UK concept of brain-stem death and the Transplantation of Human Organs (THO) Act was passed by Indian parliament in 1994 which legalized the Brain-stem death.<sup>[8][9]</sup> In 1995, THO rules were laid down which describe brain-death certification procedure<sup>[9][10]</sup> Despite this, the brain-death is not promptly declared in India due to lack of awareness and doubts about the legal procedure of certifying brain-death. In view of this, the state of Maharashtra has recently passed a resolution making it mandatory to declare and certify “brain-death”.<sup>[7]</sup> The Government Resolution underlines the responsibilities of hospitals registered under THO Act 1994 that is, authorized transplant centers. As the large number of brain-death occurs in nontransplant hospitals, it makes for the appropriate authority (Director of Health Services) to register all hospitals in the state that have an operation theatre and ICU as Non-Transplant Organ Retrieval Centers (NTORCs). These hospitals are permitted to certify brain-death as per procedure and then conduct organ retrieval for therapeutic purposes but not organ retrieval for therapeutic purposes but not it is mandatory now for all NTORCs and authorized transplant centers in the State to certify and notify the brain-death cases to Zonal Transplantation Co-ordination committee. This is a strong step to streamline the procedure for cadaveric organ retrieval and transplantation.

### **Conclusion:**

With the increasing availability of intensive care units even in tier 2 and tier 3 cities in India, a number of seriously ill patients are now being revived. While many may recover, a significant number end up being brain dead. It is imperative that all neurosurgeons and neurologists fully understand the intricacies of brain death. If there is no transplant coordinator or grief counsellor in the hospital.

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