

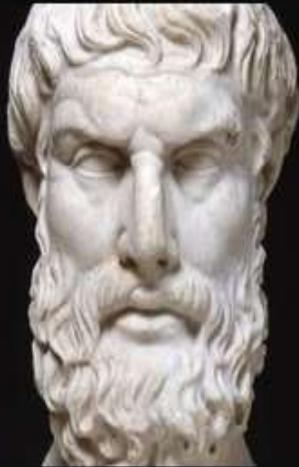
# Death Diagnosis: Revision of Different Criteria

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Epicurus



Death does not concern us,  
because as long as we exist,  
death is not here. And when it  
does come, we no longer exist.

AZ QUOTES

# Background

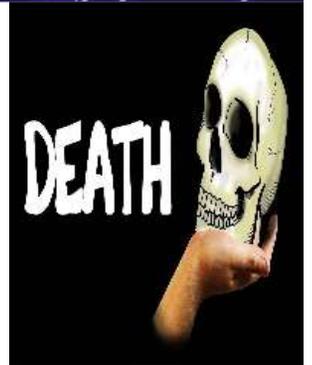


Death is an everyday medical occurrence that has social, legal, religious and cultural consequences requiring common clinical standards for its diagnosis.

Death certification can vary among countries. This paper undertakes an analysis and revision of the scientific criteria used in the diagnosis of death.

# Definition

- Death –
  - permanent loss of capacity for consciousness
  - loss of all brainstem functions
  - permanent cessation of circulation and/or after catastrophic brain injury



# History

- Humans have long used criteria and technology to diagnose death
- Somatic criteria, such as decomposition and rigor mortis, are the oldest in human history
- The link between breath and life is equally as ancient and found in both Genesis (2:7) and the Qur'an (32:9)



# History



- In the last decade, the rapid expansion of organ donation from individuals using circulatory criteria, now known as donation after circulatory death (DCD), has led to new debate about the definition and determination of death

## History of the establishment of the criteria for brain death:

**1959:** Moularet P, Goudon M. Coma dépassé et necrosis nerveuses centrales massives. Revue Neurologique 101 :116-139.

This was the reference publication proposing a name ('Coma dépassé') for the 'death of the nervous system', the clinical, electrophysiologic and angiographic features of which had been described in the French and Scandanavian literature between 1956-1959.

**1968:** The concept of brain death as death was proposed by an Ad Hoc Committee of Harvard Medical School

**1976:** UK Royal Medical Colleges defined brain death as complete irreversible loss of brainstem function and specified clinical criteria to certify brain death.

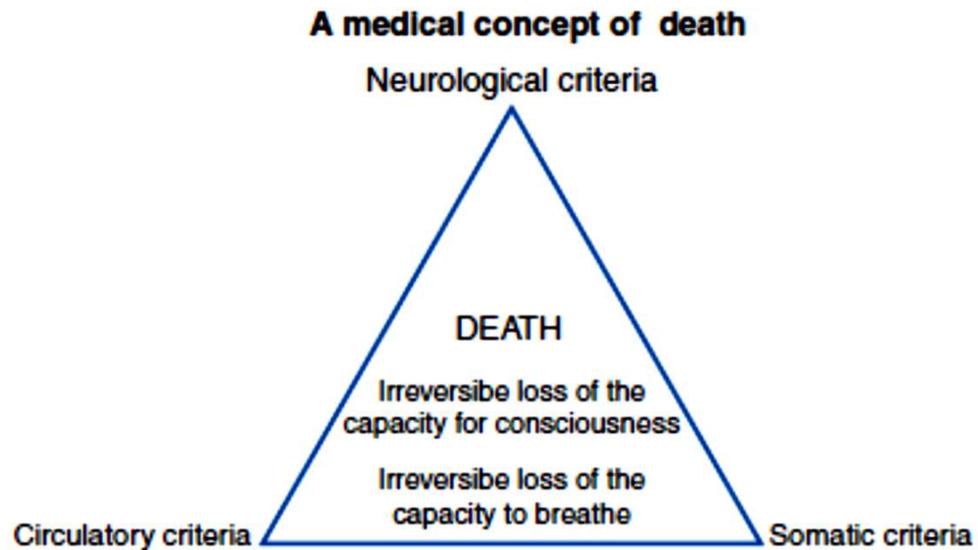
**1981:** USA Presidents Commission published Guidelines. Recommended confirmatory tests to reduce the required period of observation. Recommended a period of 24 hours observation for patients with anoxic brain damage.

**1988:** Irish Medical Journal published a Memorandum on Brain Death from an ad-hoc Irish Working Party essentially constituting guidelines for Ireland on the clinical criteria for diagnosis of brain death (3).

**1995:** Australian publication of Guidelines on clinical confirmation of brain death (4).

**2006:** Canadian Council for Donation and Transplantation published National Guidelines for determination of brain death (5).

# Criteria of death diagnosis



A unifying medical concept of death

# Somatic criteria

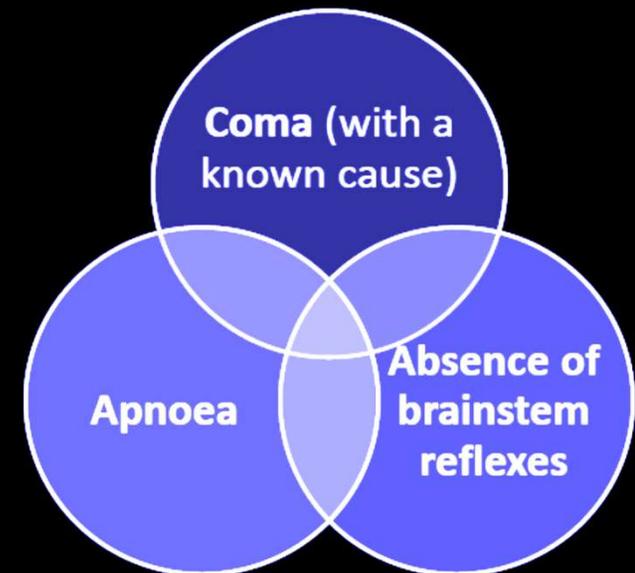


- Simple external inspection of the corpse
- The criteria are historically ancient -
  - Rigor mortis
  - Decapitation and
  - Decomposition
  - Hemicorporectomy
  - Incineration
  - Hypostasis
- It is not practical when death is more recent

# Neurological criteria

- Pre requisite-
  - ✓ Irreversible causes of brain damage
  - ✓ Exclusion of reversible causes of coma
  - ✓ Clinical testing for brain stem reflexes
  - ✓ Ancillary testing

## Brain death



# Neurological criteria

- Identification of history or physical examination findings that provides a clear etiology of brain dysfunction-
  - Severe head injury
  - Hypertensive intracerebral hemorrhage
  - Aneurysm, SAH
  - Hypoxemic-ischemic brain injury
  - Fulminant hepatic failure



# Neurological criteria



- Exclusion of reversible causes of coma-
  - Hypotension
  - Hypoxia and inadequate ventilation
  - Severe hydro-electrolyte and acid-base imbalance
  - Hypothermia (defined as temperature  $<32^{\circ}$  C)
  - severe metabolic and endocrinological alterations
  - Toxic substances and their effects
  - Large dose of neuromuscular blockers and neurodepressant drugs

# Neurological criteria

- Clinical testing for brain stem reflexes
  - Pupillary Reflex (absent)



In healthy persons, both pupils are equally wide constricted to light



Brain-dead patients, lack this reflex, Pupils dilated with non reactive to light

# Neurological criteria

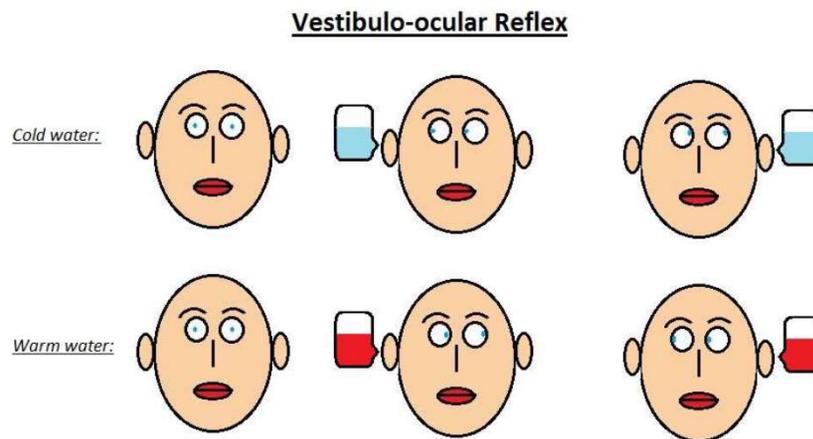
- Eye Movements
  - Occulo-Cephalic ( Dolls Eye Movements)



- Brisk turning or tipping of head cause slow eye movement to the opposite direction
- The eyes of a brain dead patient however do not react to this test and remain in their initial position

# Neurological criteria

- Occulo-Vestibular (Cold Caloric test)
  - Rule for direction of *nystagmus*



A positive Cold Caloric test indicates an intact brain stem

# Neurological criteria

- Facial Sensation and Motor Response



- Response to pain in the face.
- Brain-dead patients lack these reflexes.

# Neurological criteria



- Pharyngeal (Gag) Reflex - absent
- Tracheal (Cough) Reflex- Absent
- Corneal reflex -Absent

# Neurological criteria



- Apnea Test
- Pre-requisites-
  - Body Temperature  $> 36^{\circ}$  C
  - Systolic Blood Pressure  $\geq 100$  mm Hg
  - Normal Electrolytes profile
  - Normal PaCO<sub>2</sub> (35-45 mm Hg)
- Pre-Oxygenation
  - 100% Oxygen via Tracheal Cannula for 10 min
  - monitor SpO<sub>2</sub>

# Neurological criteria



- Apnea Test...
  - Reduce Ventilation frequency to 10/min
  - Reduce PEEP to 5 Cm H<sub>2</sub>O
  - Take 1st Blood sample for Blood Gas analysis
  - Disconnect Ventilator
  - Deliver 100% O<sub>2</sub> by catheter through ET tube @ 6 L/min
  - Observe for Respiratory Movement
  - At least for 8 – 10 min

# Neurological criteria

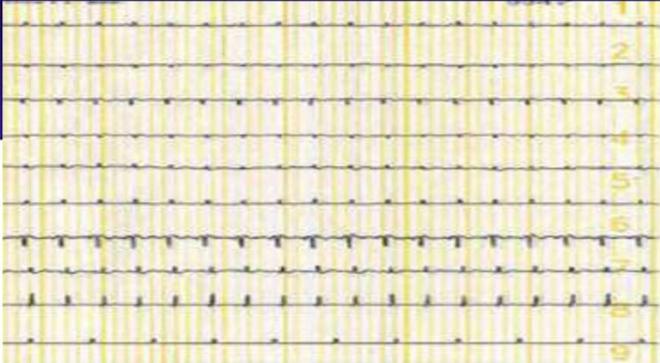
- Apnea Test....
  - If no respiratory drive observed after 08 min
    - Take next Blood sample for Blood gas studies
    - Reconnect ventilator
  - Discontinue Testing
    - If BP drops to  $< 90$  mm Hg
    - SpO<sub>2</sub> ↓ to 85% by pulse Oximetry for 30 Sec
    - respiratory movements are absent
    - arterial PaCO<sub>2</sub> is increased.

# Neurological criteria



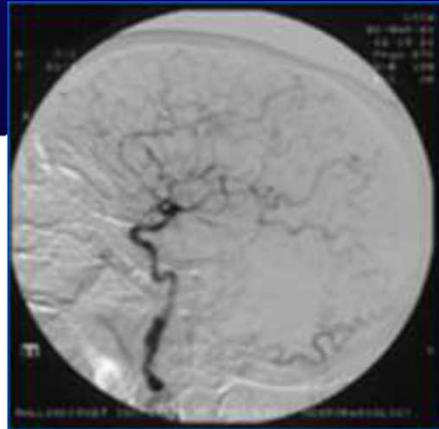
- Ancillary Confirmatory Testing
  - Recommended when
    - Proximate cause of coma is not known
    - Apnea testing inconclusive or aborted or
    - When confounding clinical conditions limit clinical examination

## EEG



Electro cerebral silence

## Cerebral Angiography

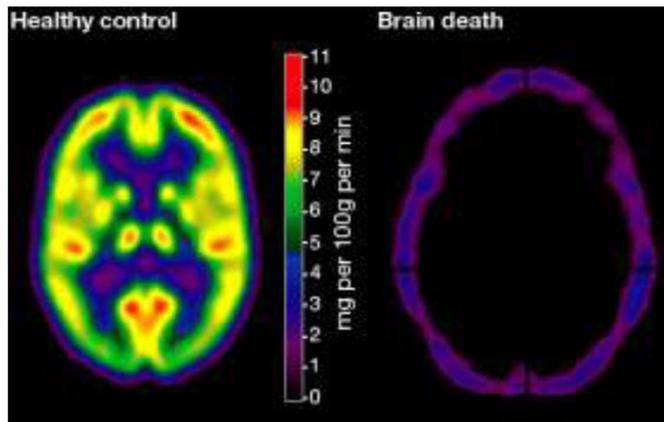


Normal

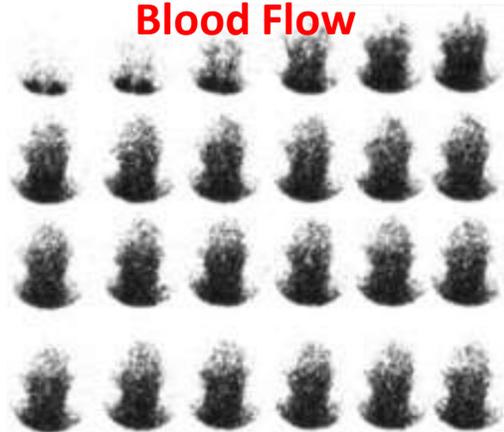


Brain Death

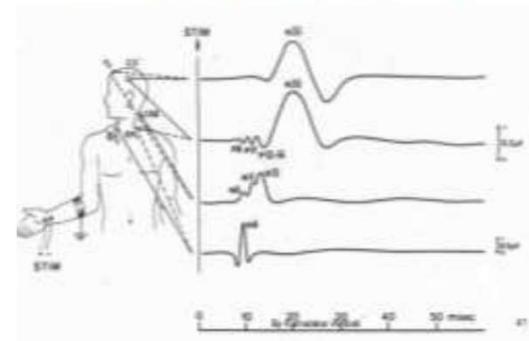
## Glucose metabolism studies PET



## Blood Flow



## Somatosensory Evoked Potentials



# Cardiocirculatory criteria



- Cardiocirculatory arrest-
  - unresponsiveness
  - absence of breathing or only occasional gasps
  - absence of circulation
- Then one of two things must occur:
  - Cardiopulmonary resuscitation (CPR) is not attempted;
  - or
  - CPR is attempted but fails

# Cardiocirculatory criteria



- For all patients, regardless of setting, the absence of circulation should be confirmed by a clinical diagnosis-
  - absence of a central pulse on palpation
  - absence of heart sound on auscultation
  - absence of breathing
  - absence of pupillary responses to light

# Cardiocirculatory criteria



- Instrumental tests should be performed if indicated:
  - asystole or pulseless electrical activity on a continuous ECG display; and/or
  - absence of pulsatile flow during intra-arterial pressure monitoring; and/or
  - absence of contractile activity using echocardiography.

# Declaration of death



- Two appropriately qualified clinicians are required to diagnose brainstem death one of them must be a consultant but should not be from the transplant unit
- Observation period varies between countries
  - At least 5 min is recommended for cardiorespiratory death

# Diagnosis of Death: Past, Present & Future

- In the past, death has been defined as the separation of the soul and body
- Life support technologies introduced in the 20th century have generated a new kind of patient, one whose brain does not function but whose heart and lungs continue to work
- The criteria of death continues to evolve with adoption of modern technology the future definition will be at Gene /DNA level

# Recommendation



- Different countries have their own guideline to diagnose death
- In Bangladesh, there are no standard sets of criteria to diagnose death
- Bangladesh Society of Medicine may take proper steps to set a guideline for death diagnosis

# Conflict of Interest



No conflict of interest

# Conclusion



- There are numerous ways of dying but just one way to be dead
- It is of central importance to achieve international consensus on the clinical criteria for the determination of death to maintain public trust and promote ethical practices

# References



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*Thank you*

