

In the name of Allah ,the  
beneficent,the most merciful



Please note...

Principles of  
adult  
learning are  
valued here.



# Meaning thereby

- Respect
- Two way learning please
- Prior intimation of topic
- Flip classroom techniques
- My class my rules.if you are not interested ,plz give roll number to lecture hall attendant,we ll make sure to facilitate you .
- Punctuality
- Take home messege

welcome



# In modern days, a teacher is a facilitator

- **Books you should follow**
- Principles and practice of forensic medicine by Naseeb R Awan .
- K pareikh
- PC dikshit
- Siddique hussain
- **Reference books**
- Knight,s forensic pathology
- Forensic medicine &toxicology by Gautam Biswas



# THANATOLOGY

# Learning objectives

- At the end of this 50 min. lecture to 100 students of 3<sup>rd</sup> year mbbs, the students should be able to
- Classify death
- Enumerate the essential indicators of somatic death
- Confirmation of death
- It ll be facilitatd through use of multimedia, audiovisual aids.
- There ll be a Q&A session at the end for your queries.



# LO

- Any volunteer to narrate take home message
- Assessment through candy question after two lectures.



# Importance

- A. Scientifically – to declare the death
- B. Practically – death certificate writing
- C. Forensically – changes after death

كُلُّ نَفْسٍ ذَائِقَةُ الْمَوْتِ وَإِنَّمَا تُوَفَّقُونَ

أَجُورَ كُمْ يَوْمَ الْقِيَامَةِ فَمَنْ زُحْزِحَ عَنِ النَّارِ وَأُدْخِلَ الْجَنَّةَ فَقَدْ فَازَ

وَمَا الْحَيَاةُ الدُّنْيَا إِلَّا مَتَاعٌ الْغُرُورِ ﴿١٨٥﴾

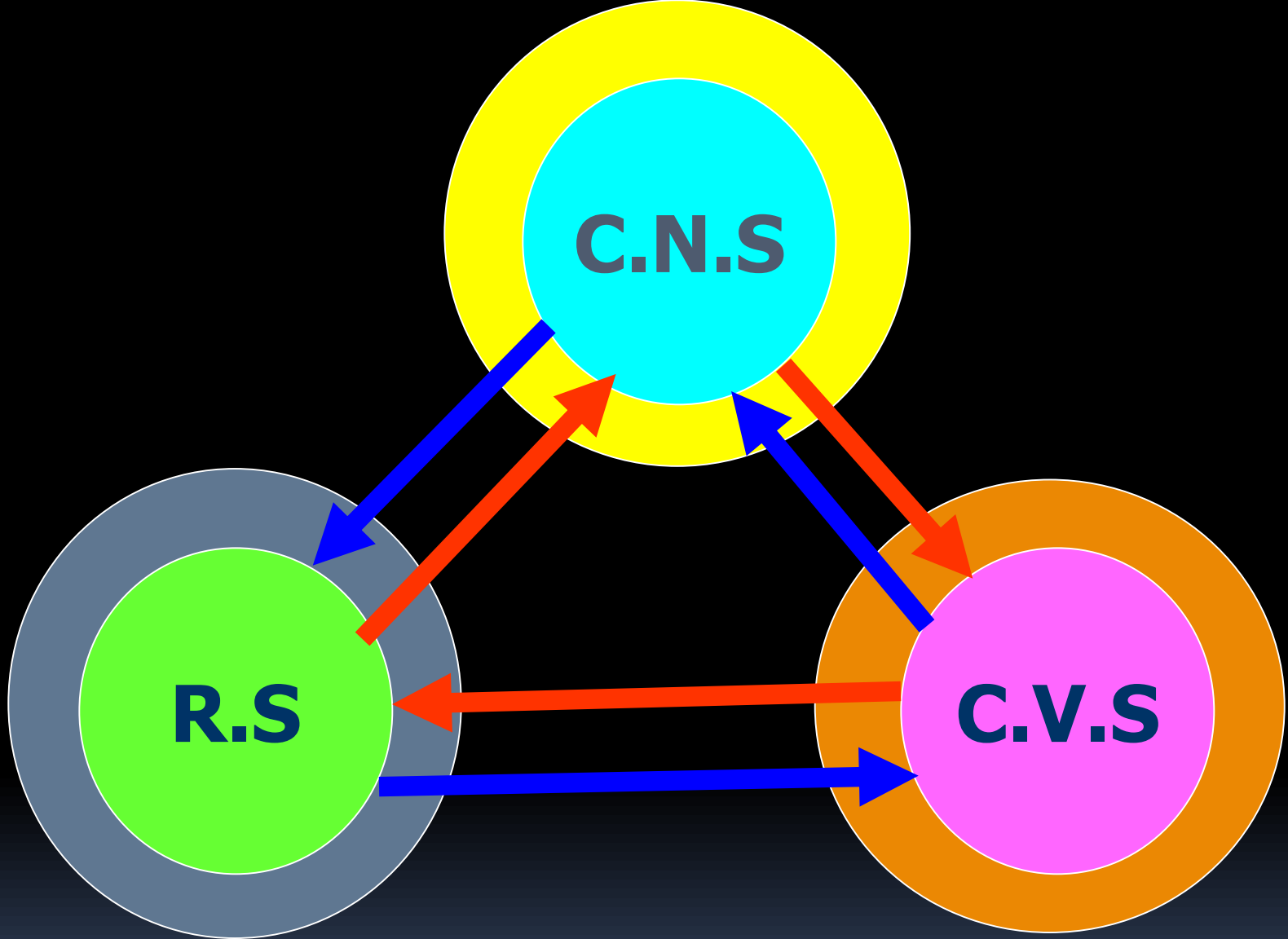
سورة العنكبوت ٣ : ١٨٥

ہر جان موت کا مزا چکھنے والی ہے اور قیامت کے دن تم اپنے بدلے پورے پورے  
دیئے جاؤ گے، پس جو شخص آگ سے ہٹا دیا جائے اور جنت میں داخل کر دیا جائے  
بیشک وہ کامیاب ہو گیا اور دنیا کی زندگی تو صرف دھوکے کی جنس ہے

سورة العمران ۳: ۱۸۵

# **MEDICOLEGAL ASPECTS OF DEATH**

- ✓ **Definition & Types of Death**
- ✓ **Diagnosis of Death**
- ✓ **Duties of a doctor in case of death**
- ✓ **Cause, Mechanism/Mode & Manner of Death**
- ✓ **Certification of Cause of Death**
- ✓ **Sudden Death, Definition & classification**
- ✓ **Causes of Sudden Death**
- ✓ **Medicolegal Investigation of Death**
- ✓ **Laws related to Death**



**DIAGRAMATIC INTERDEPENDENCE OF TRIPOD  
OF LIFE**

# THANATOLOGY:

“Scientific study of Phenomena & Practices relating to death”.

## A) DEFINITION OF DEATH:

a) **collin,s Dictionary** death is the permanent end of the life of a person or animal.

b) **From biological point of view** Death can be defined as “irreversible loss of the properties of living matter”.

## **B) TYPES OF DEATH:conventionally**

**1. Systemic or Somatic Death**

**2. Molecular or Cellular Death**

**1. SOMATIC DEATH--** (Soma means body)

It is extinction of personality due to irreversible loss of the integrity & interdependence of respiratory, nervous system & cardiovascular

(It involves the organism as a whole).

It enables the medical practitioners to certify that death has occurred. (accepted as time of death for all legal purposes).

## **2. MOLECULAR DEATH (CELLULAR/ORGANIC)**

It is progressive disintegration of the body tissues. It means the death of cells and tissues individually.

### **Life after death of different tissues**

(Ability to resist hypoxia)

- i. Nervous tissue ----- only few minutes
- ii. Muscular tissue ----- about 3 hours
- iii. Cornea ----- about 6 hours
- iv. Skin ----- about 12 hours

**This time has importance in organ transplantation**



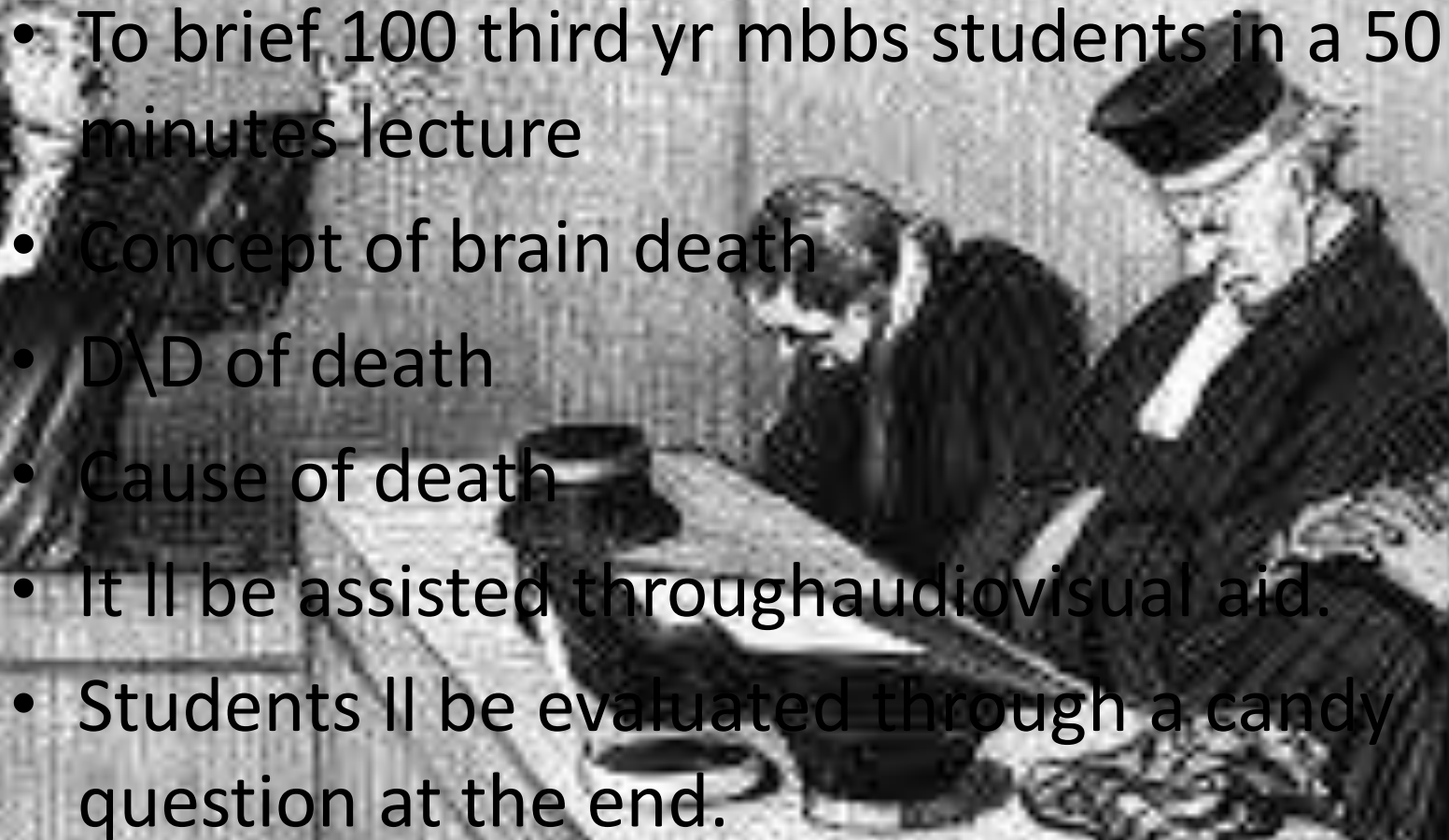


# Diagnosis of Death

- Importance of Diagnosis
- Concepts about Death
- Confirmatory signs of Death
- Confirmatory tests of brain Death
- Differential Diagnosis (D/D) of Death

سرگودھا (نمائندہ ایکسپریس) چلڈرن ہسپتال لاہور میں مردہ قرار دی جانے والی بچی سرگودھا واپس آتے ہوئے شیخوپورہ کے قریب زندہ ہو گئی، ماتم والا گھر خوشیوں میں بدل گیا، تفصیلات کے مطابق ملت آباد کے رہائشی محمد کاشف کی چھ ماہ کی بیٹی تنزیلہ مسلسل بیمار چلی آرہی تھی، مقامی ہسپتالوں سے علاج کروانے کے بعد جب بچی کی طبیعت نہ سنبھلی تو اہل خانہ اسے چلڈرن ہسپتال لاہور لے گئے جہاں چار روز تک زیر علاج رکھنے کے بعد گزشتہ روز دوپہر ایک بجے ڈاکٹروں نے بچی کو مردہ قرار دیدیا، ڈاکٹروں کی طرف سے بچی کی وفات کی تصدیق کرنے کے بعد اہل خانہ اسے لیکر سرگودھا واپس آرہے تھے کہ شیخوپورہ کے قریب بچی کا سانس دوبارہ چلنے لگ گیا، بچی کے اہلخانہ نے ایکسپریس نیوز سے گفتگو کرتے ہوئے کہا کہ ڈاکٹرز کی طرف سے انتقال کی تصدیق کے بعد انہوں نے بچی کی تدفین کا انتظام کر لیا تھا، لیکن جیسے ہی بچی کے زندہ ہونے کی اطلاع ملی تو ماتم والے گھر میں خوشیوں کی لہر دوڑ گئی، بچی کے زندہ ہونے کی خبر سن کر اہل محلہ کی بڑی تعداد اسے دیکھنے کے لیے جمع ہو گئی، لوگ مبارکباد دیتے رہے، بچی کے والدین کا کہنا تھا کہ وہ بچی کو نئی زندگی ملنے پر اللہ تعالیٰ کا لاکھ لاکھ شکر ادا کرتے ہیں، بچی کا دوبارہ زندہ ہونا معجزے سے کم نہیں۔

# Lecture outcomes

- To brief 100 third yr mbbs students in a 50 minutes lecture
  - Concept of brain death
  - D\D of death
  - Cause of death
  - It ll be assisted through audiovisual aid.
  - Students ll be evaluated through a candy question at the end.
- 

# Concepts About Death?

## OLD CONCEPT (Conventional):

“Cessation of respiratory movement & absence of detectable heart beat”.

(Stoppage of cardio respiratory complex).

**Due to Modern advances in medical care the older concept does not remain valid in some situations as explained next:**



# Complications in certification of death in old concept

- a) Now it is possible to stop both respiration & circulation for some time by **lowering the body temperature** & then on rewarming, restart it.
- b) **Strong hypnotics & tranquilizer overdose and encephalitis** produce the similar states in which respiration and circulation are nearly stopped.

# Complications in certification of death in old concept

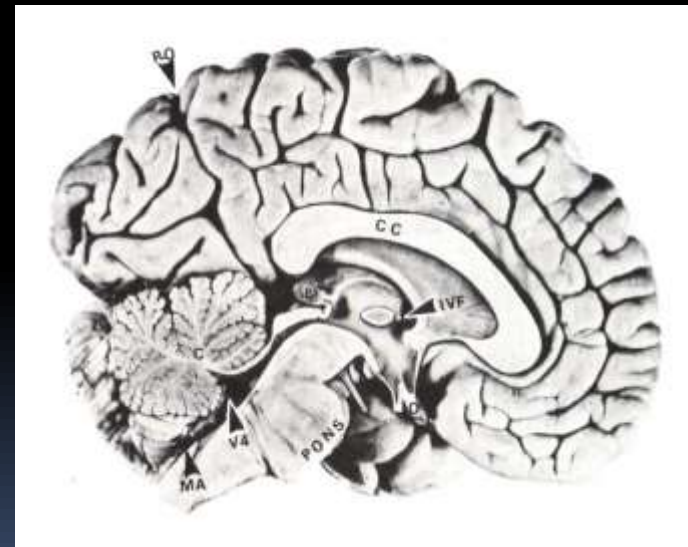
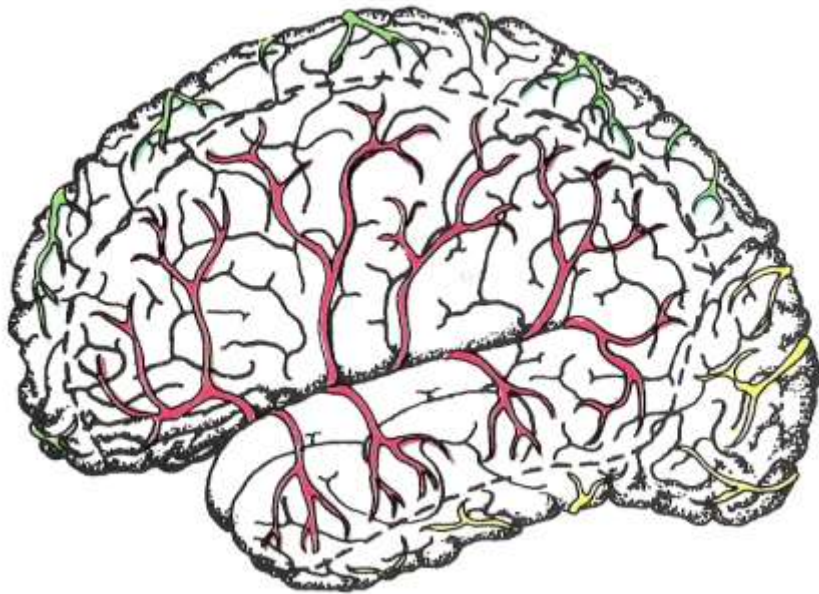
- C) The modern resuscitative techniques (ventilator) have made it possible to maintain both circulation & respiration for indefinite periods in cases that take no claim of life.**

**All this has lead to the belief that stoppage of respiration & circulation alone does not constitute death.**

# NEW CONCEPT

## BRAIN DEATH / BRAIN STEM DEATH:

Irreversible cessation of all functions of the entire brain, including the brainstem. Brain includes all CNS structures except spinal cord.





# DIAGNOSIS OF DEATH

## A. CARDIOPULMONARY CRITERIA:

**"Conventional Criteria"** usually based on **"PRINCIPAL SIGNS OF DEATH"** those are

### a) Cessation of Respiration:

1. Careful inspection of chest & abdomen
2. Auscultation

### b) Cessation of Circulation:

1. Palpation of Pulse
2. Auscultation (4-5 min)
3. ECG

## **B. NEUROLOGICAL CRITERIA:**

It is **“Modern Criteria”** for diagnosis of death. Also called criteria of **“Brain Death”**.

There is irreversible cessation of all the functions of entire brain, including the brain stem.

It is specially important in diagnosis of death in patients on mechanical ventilation and cardiovascular support.

# CLINICAL DETERMINATION OF BRAIN DEATH

## A. Absence of cerebrally modulated motor responses.

Painful stimuli are applied with pressure to the supraorbital ridge & the nail beds. There is no movement in the extremities.

## **B. ABSENCE OF ALL THE BRAIN STEM REFLEXES :**

- i. The Pupillary light reflex is absent.**
- ii. Corneal reflex is absent.**
- iii. Oculococephalic (doll's eye) reflex is absent.**
- iv. Vestibulo ocular (caloric test reflexes) absent.**
- v. No gag & cough reflex.**

## CLINICAL DETERMINATION OF BRAIN DEATH (contd...)

- C) No motor response within cranial nerve distribution by adequate stimulation.**
- D) Positive apnea Test:** After disconnecting ventilator, no respiratory movement occurs for 8—10mints even by stimulation of respiratory centre with increase in Co<sub>2</sub> level to more than 8 kPa (80 mm Hg).

# Apnea Testing Procedure

1. Disconnect the ventilator.
2. Deliver 100% oxygen.
3. Observe the patient closely for respiratory movements up to 10 min.
4. Measure PaCo<sub>2</sub> after 10 minutes and reconnect the ventilator.



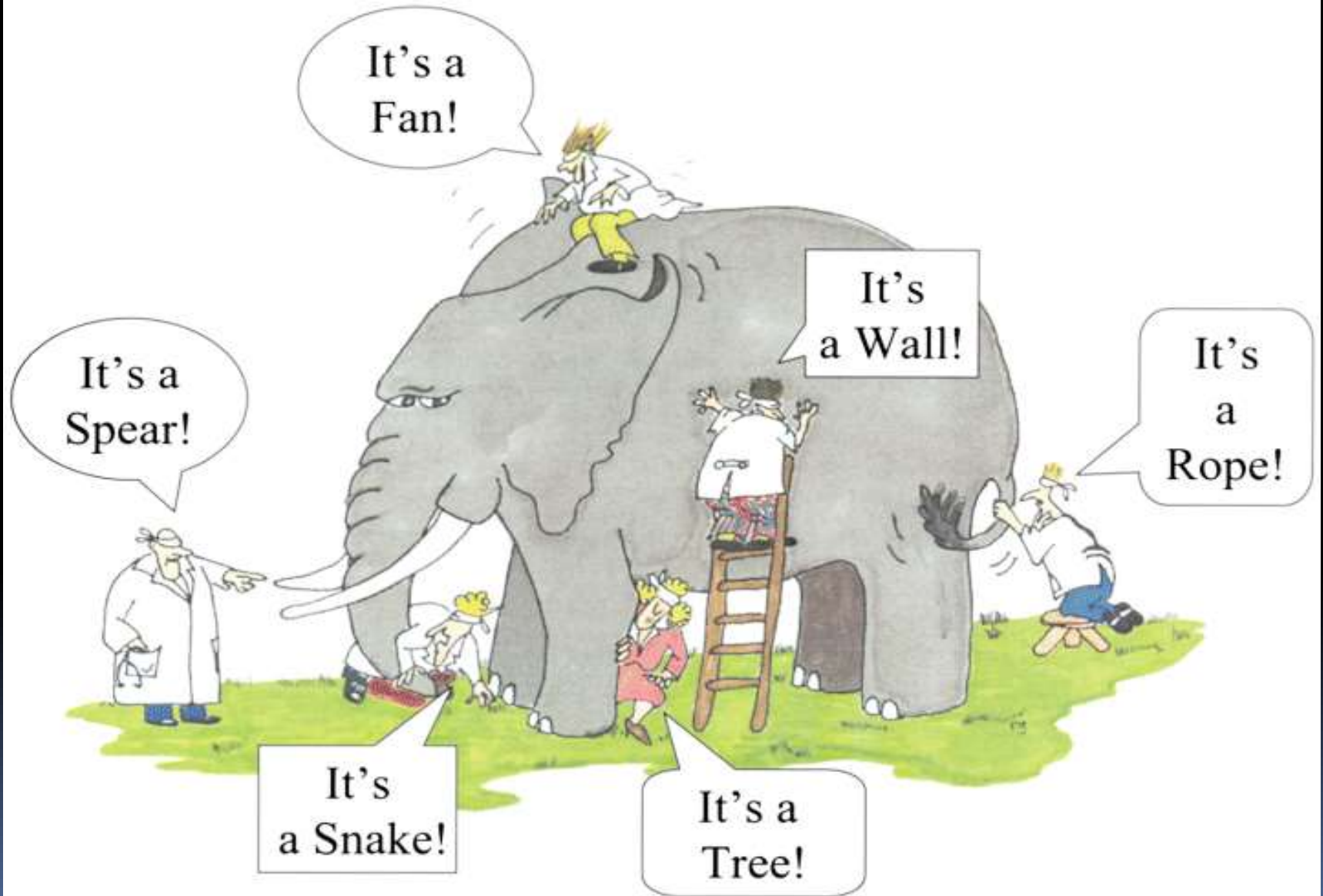
**If no respiratory movement occurs at PaCo<sub>2</sub> 8 kPa (80 mm Hg) or more – test is positive indicating brain death.**

# What is kPa

(kPa = Kilopascal arterial)

- Definition: Kilopascal is a unit of pressure of gases in blood.
- 1 kPa is approximately the pressure exerted by a 10g mass resting on a 1-cm<sup>2</sup> area. 101.3 kPa = 1 atm. There are 1,000 pascals in 1 kilopascal.

?????





# Confirmatory Signs of Death

- Complete loss of sensations.
- Complete loss of voluntary power to move.
- All reflexes are lost (especially see bilateral fixed, dilated pupil).
- EEG flat continuous for 5 min.
- Complete cessation of respiration.
- Apnea test-- positive.
- Heart beat absent.
- ECG flat continuous for 5 min.

# Clinical criteria for the certification of death

Criteria	Significance
Bilateral fixed dilation of the pupils	Essential
Complete absence of reflexes both natural and to profound pain.	Essential
Complete absence of respiration.	Essential
Failing BP needing increasing amounts of vaso-constrictive drugs.	Additional
Flat EEG for at least six minutes.	Additional

# **USA and U.K Code (set of guidelines) for Death Certification**

- 1. Drug intoxication, hypothermia, metabolic & endocrine disturbances have been excluded as a cause of coma.**
- 2. The patient in coma on ventilator and has a positive diagnosis of cause of coma preferably showing irreversible structural damage to brain.**

# **USA and U.K Code (set of guidelines) for Death Certification (contd...)**

- 3. Complete loss of brain stem functions.  
Reflexes as pupil, corneal, facial, occulo-cephalic and occulo-vestibular should be absent.**
- 4. The patient should remain apnoic after disconnection from the ventilator long enough to ensure that the arterial CO<sub>2</sub> tension is above 8 kPa (80 mm Hg) which is the level capable of driving the respiratory centre.**

# D/D OF DEATH

## **SUSPENDED ANIMATION(Apparent Death):**

Death-like state in which metabolic rate may be so reduced that the  $O_2$  requirement of the individual cells are satisfied through the use of  $O_2$  dissolved in body fluids. So cardio-respiratory action may not be detectable

## **CAUSES:**

- Hypothermia (temp. should be  $>35$  °c)
- Drug over-dose (specially barbiturates)
- Severe shock due to electrocution/drowning

# ADVISED PRINCIPALES FOR ETERMINATION OF DEATH

According to world medical association

1. Saving of life is superior than preservation of isolated cells(organs).
2. Certification must be based on clinical examination.
3. When transplant surgery is involved, death should be certified at least by two doctors not connected with the transplant team.

(D)

- a) Causes,
- b) Mechanisms,
- c) Modes and
- d) Manners of Death

## a) CAUSE OF DEATH

A disease, injury or poison that results in the death of an individual.

**The Cause of death is a medical determination.**

If there is a delay between the onset of the disease / injury and the time of death, then the cause can be divided into one of the following categories:

- **Original or underlying**
- **Intermediate**
- **Immediate (directly leading to death)**



## Example:

An individual who is shot in the spine and survives. Over the next 20 years, the urinary bladder becomes repeatedly infected. Finally, the patient develops pyelonephritis and dies. In this case, the

### 1. underlying cause of death

is gunshot wound to the spine.

### 2. Intermediate cause

is repeated urinary tract infection.

### 3. Immediate cause

of death is pyelonephritis.



# Candy question

Not important in brain death

a. EEG

b. ECG

c. Absence of brainstem reflexes

d. Body temperature



**God Bless You !!**

# Learning objectives

- At the end of this 45 minute lecture to 100 students of 3<sup>rd</sup> year mbbs, the students should be able to
- Define and exemplify mechanism, mode and manner of death
- Fill in the death certificate according to WHO criteria.
- It will be aided by use of multimedia .
- Evaluation will be done through Q&A sessions at the end of the class.



## B) MECHANISM OF DEATH

Train of changes in body physiology or biochemistry which is incompatible with life  
It is a pathway to death produced by injury, disease or poison e.g.

- Haemorrhage
- Ventricular fibrillation
- Severe acidosis or alkalosis
- Toxemia

## c) Modes of death

**An abnormal physiological state pertained at the time of death.**

Failure of any of three vital systems of the body (Tripode of life) is called mode of life. Three classical modes of death relating to vital systems are:

- a. **CCF/Shock ... Failure of CVS**
- b. **COMA ..... Failure of CNS**
- c. **Asphyxia ..... Failure of Resp. system**

### **:Note**

All dead people suffer from low blood pressure (shock), bronchopneumonia, syncope, pulmonary oedema, cardiac arrest and pulmonary arrest. So these terms are specifically prohibited from using as a cause of death

## d) MANNER OF DEATH

It is the way, fashion or circumstances of death. In this intention is also seen.

The manner of a person's death is a legal determination.

A. **Natural Death-----**when the cause of death is due to the disease

B. **Unnatural Death-----** When the cause of death is other than the disease which are **trauma and intoxication**

# THREE TYPES OF UNNATURAL DEATH

- **Homicide---** Intention to kill others.
- **Suicide-----** Intention to kill himself.
- **Accident---** Death by accident without any intention.
- **Undetermined---**  
Evidence not enough to choose the manner of death.



# DUTIES OF A DOCTOR IN CASES OF DEATH

1. Diagnosis of death.
2. To rule out any medical grounds for suspicion.
3. To issue a death certificate.
4. To refer case for autopsy if not certain about cause of death.

## LEGAL ASPECTS:

1. Registration of death.
2. Disposal of the dead body.

**WHICH CUP  
WILL FILL  
FIRST?**



# DEATH CERTIFICATE

## (Certification of Death)

### OBJECTIVES

1. To certify that death has occurred.
2. To give the cause of death.
3. To help in compiling data for future planning regarding health management.

# Important Principle for Death Certification

When stating cause of death,

**“Precise Terms”** of responsible morbid conditions e.g. Cerebral Haemorrhage or Coronary thrombosis are used.

**“Vague Terms”** e.g. Respiratory Failure, Heart Failure or Low Blood Pressure (shock) should be avoided to be used as cause of death.

In 1993, at K.E.M.C. 1000 death certificates were collected from various Hospitals in Lahore & the cause of death documented was as follows:

Cause of death	No. of Certificates	%age
1. Cardio respiratory failure	823	82.3%
2. To be ascertained at autopsy	23	2.3%
3. Other causes	144	14.4%
4. Left blank	10	1 %

# INTERNATIONAL FORM OF MEDICAL CERTIFICATE OF CAUSE OF DEATH

## (Part I)

### Direct/immediate cause

Disease or condition  
directly leading to  
Death\*.

(a) .....  
due to (or as a  
consequence of)

### Antecedent cause(intermediate cause)

(b) .....

due to (or as a  
consequence of)

\* This does not mean the mode of dying, such as e.g. heart failure, asphyxia, asthenia, etc. It means the disease, injury or complication which caused death.

# Death certificate

## Underlying cause

Morbid conditions,  
if any, giving rise to  
the above cause

© .....

stating the underlying  
condition last.

# Death certificate (contd...)

## (Part II)

### Contributing Causes

Other significant .....  
conditions contributing .....  
to the death but not .....  
related to the disease .....  
or condition causing it.



# EXAMPLES

1. Adult dying of peritonitis resulting from perforation of a duodenal ulcer, Diabetes Mellitus also being present.

I (a) **Direct cause**--Peritonitis:..... 2 days.

(b) **Antecedent cause**--Perforation of duodenum: ...4 days.

(c) **underlying cause**--Duodenal ulcer: ..... 6 months.

II **Others contributing factor**—Diabetes Mellitus.....3 years.

Happy holidays



2. Elderly man dying of hypostatic pneumonia after being bedridden owing to fracture of the neck of femur caused by fall from a ladder at home.

I. (a) Hypostatic pneumonia: ..... 1 day.

(b) Fracture of neck of femur:...7 days.

(c) Fall from ladder at home:.....7 days.

The under lying cause is fall from ladder at home.

2. Adult dying cerebral haemorrhage due to hypertension following chronic nephritis.

1. (a) Cerebral Haemorrhage ..... 3 days

(b) Hypertension ..... 5 years

(c) Chronic Nephritis..... 6 years

The underlying cause is chronic nephritis.



# thanatology

By Dr summyia sadia

Assistant professor



## F) SUDDEN DEATH

**The name sudden death is given to those deaths**

- a) Which are not preceded or are only preceded for a short period (a few seconds to 24 hours) by morbid symptoms.
- b) In this, the cause of death cannot be certified with confidence by medical practitioner.

# Classification of sudden Death

## 1. Natural Death:

It is due to a disease or senility.

## 2. Unnatural Death (Violent Death): It is due to the application of force or introduction of a poison & is of three types.

- i. Homicidal
- ii. Suicidal
- iii. Accidental

# Causes of sudden natural death in adults

**CVS: ( 45—50 % )**

- A.** Ischemic heart disease.
- B.** Hypertensive heart disease.
- C.** Myocarditis.
- D.** Aortic aneurysm.
- E.** Cardiac arrest due to vagal inhibition



# Respiratory System: ( 15 – 25 % )

- A. Pulmonary thrombo-embolism
- B. Infections as
  - i. Pneumonia
  - ii. Acute epiglottitis
- C. Bronchial asthma
- D. Spontaneous pneumothorax
- E. Tumors of bronchus/lungs

# **CNS: ( 10 – 15 % )**

- A. Epilepsy**
- B. Intracerebral haemorrhage**
- C. Cerebral infarction**
- D. CNS Infection – e.g. Meningitis**
- E. Brain tumors**

# **GIT: ( 05 – 10 % )**

- A. Esophageal varices (massive bleeding)**
- B. Gastric or duodenal ulcer (massive haemorrhage)**
- C. Strangulated hernias**
- D. Pancreatitis**

## **Miscellaneous: ( 05 – 10 % )**

- A. Chronic alcoholic abuse**
- B. Advanced cirrhosis of liver**
- C. Adrenal disorders e.g.  
pheochromocytoma**
- D. Ruptured tubal pregnancy**

# G) MEDICOLEGAL INVESTIGATION OF DEATH

**Primary purpose is to establish the cause & manner of death.**

**The investigation is held to determine:**

- **Who died?**
- **Where died?**
- **When died?**
- **Why died?**
- **How died?**

# Steps of Death Investigation

- i. Investigation of the circumstances of death.
- ii. Examination of the body.
- iii. Laboratory tests.


# Principles of Death Investigation

1. **Expeditious**
2. **Thorough**
3. **Impartial**
4. **Public rights respected**

# Important Systems of Death Investigation in the world:

1. Coroner System.
2. Medical Examiner System.
3. Procurator Fiscal System.
4. Continental system.



- 
- May be either a lawyer or a doctor. Some are doubly qualified.
  - **1. CORONER:** Investigates obscure or unnatural death.  
**(ENGLAND, WALES AND SOME CITIES OF INDIA)**
  - Coroner can hold inquests where appropriate.
  - Can order a Post Mortem Examination.

## 01-Coroner (contd...)

- Can send the case to police for further proceedings where serious crime is involved.
- The Office of Coroner is an independent one. Only the High Court can issue instructions to Coroners.
- In larger cities appointment of coroner is whole time while in smaller cities it is part time.

## 02-Medical Examiners: (USA)

- He/she is always a doctor.
- Investigates unexplained, unexpected & unnatural deaths.
- Also responsible for determination of the cause of death.
- Has legal powers to visit scene of crime & investigation into circumstances of death.

# 03- Procurator Fiscal system: (Scotland)

- Always a lawyer has powers to investigate sudden, unexplained or suspicious deaths.
- May request Post Mortem examination for determination of cause of death.
- His main interest is in excluding criminality or possible negligence involved in death.
- If death is criminal, may order police for further enquiries.

## 04-Continental System

(Pakistan & some parts of India)

- In Pakistan, death investigation is carried out by a police officer or a magistrate authorized by the government.
- Procedure of death investigation is laid down in **section 174-176** of criminal procedure code (CrPC).

## ■ 04-Continental System ■ (Pakistan & some parts of India)

- On receiving information regarding unnatural deaths or those occurring under suspicious circumstances, investigating police officer proceeds the site of death.
- He investigates the circumstances, examines the witnesses and makes initial opinion about cause and manner of death.

## ■ 04-Continental System

### ■ (Pakistan & some parts of India)

- Investigating police officer forwards the report to the magistrate and sends the body for post-mortem examination, if there is any doubt regarding cause of death.
- Deaths in police custody are investigated by the magistrate and the autopsy is performed by District standing medical board .