Pulse oxymetry

BY A.SWAROOPA

DEFINITION

IT IS A NON INVASIVE DEVICE USED TO MEASURE BLOOD OXYGEN LEVELS AND CAN ALSO DISPLAY HEART RATE.

A PULSE OXIMETER IS A MEDICAL DEVICE THAT INDIRECTLY MONITORS THE OXYGEN SATURATION OF A PATIENT'S BLOOD

PURPOSES OF PULSE OXYMETRY:

- PULSE OXYMETERS MEASURE THE ARTERIAL OXYGEN SATURATION OF HAEMOGLOBIN.
- TO RELIEVE CYANOSIS BY DETECTING HYPOXIA AND SEVEOUR RESPIRATORY FAILURE.
- PULSE OXIMETERS MEASURE:

1. THE OXYGEN SATURATION OF HAEMOGLOBIN IN ARTERIAL BLOOD
2. THE PULSE RATE - IN BEATS PER MINUTE

FUNCTIONS

- IT IS A SAFE AND SIMPLE METHOD OF ASSESSING OXYGENATION.

- IT IS NONINVASIVE.

- ACCEPTABLE NORMAL RANGES ARE FROM 95 TO 100 PERCENT.

- CONVENIENT ANDMEASUREMENT CAN BE CONTINOUS.

Pulse oxymetry is indicated in

a. Any situation when hypoxia may occur

eg. very severe pneumonia
severe bronchiolitis
status asthmaticus
acute stridor
uncontrolled heart failure
profound shock
encephalopathy with respiratory depression.

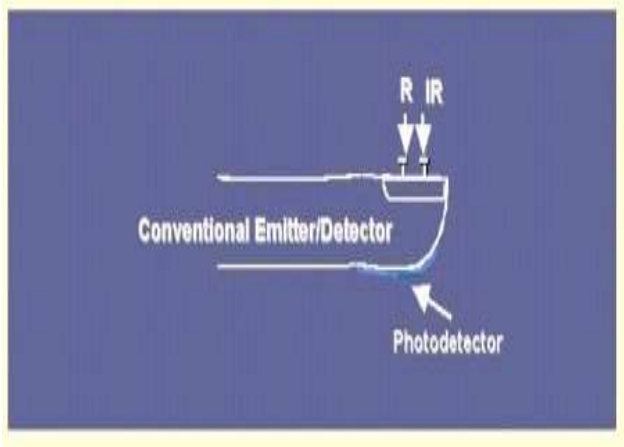
b. Monitoring in case of
- sleep - apnoea syndrome
- Apnoea of prematurity
- oxygen dependent premature baby, if memory facilities are induced in system.

Great advantage is that measurement can be CONTINUOUS. It can replace blood gas analysis in many situations except where analysis of PCO_2 and acid-base status is essential. It does not provide an absolute indicator of hyperoxia.

OXYMETRY PROVIDES ACCURATE

OXIMETERS CONSIST OF

- 😐PERIPHERAL PROBE
- 😐A MICROPROCESSOR UNIT DISPLAYS A WAVEFORM, THE OXYGEN SATURATION AND THE PULSE RATE.
- ☺RED AND INFRARED LIGHT EMITERS DETECTOR
- 😐MOST OXIMETERS ALSO HAVE AN AUDIBLE PULSE TONE,



PRINCIPLES OF PULSE OXIMETRY TECHNOLOGY

↳IT IS BASED ON THE RED AND INFRARED LIGHT ABSORPTION CHARACTERISTICS OF OXYGENATED AND DEOXYGENATED HEMOGLOBIN.

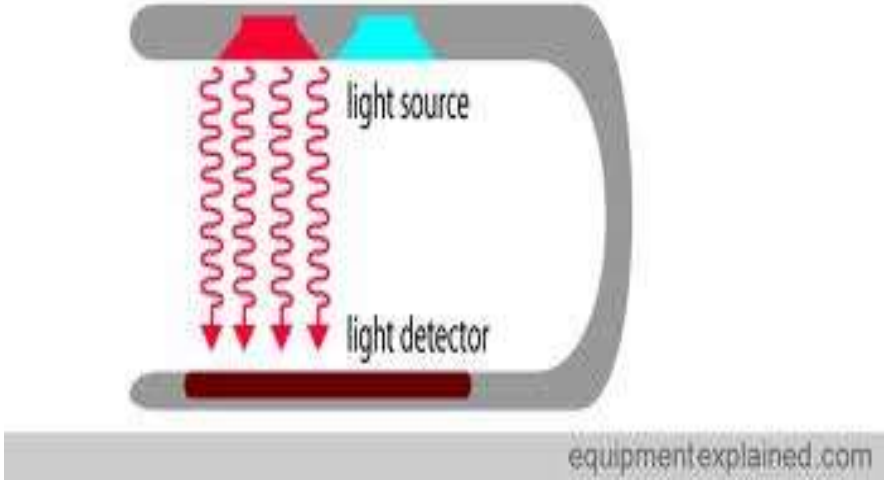
↳RED LIGHT IS IN THE 600-750 NM WAVELENGTH LIGHT BAND. INFRARED LIGHT IS IN THE 850-1000 NM WAVELENGTH LIGHT BAND.

PULSE OXIMETRY WORKS BY PLACING A PULSATING ARTERIOLAR VASCULAR BED BETWEEN A DUAL LIGHT (RED AND INFRARED) SOURCE AND A PHOTODETECTOR.

THE PHOTODETECTOR RECORDS THE RELATIVE AMOUNT OF EACH COLOR ABSORBED BY ARTERIAL BLOOD AND TRANSMITS THE DATA TO A MONITOR, WHICH DISPLAYS THE INFORMATION WITH EACH HEARTBEAT.

- IF BLOOD IS RICH IN OXYGEN, THEN IT EASILY ABSORBS THE INFRARED LIGHT AND ALLOWS IT TO PASS.

- A HEALTHY PERSON HAS SATURATION LEVEL RANGING FROM 95 TO 99 PERCENT.



GENERALLY MEASURED ON:

- VARIOUS SITES LIKE
- THE FINGER
- TOE
- PINNA (TOP) OR LOBE OF THE EAR
- INFANTS - THE BRIDGE OF THE NOSE,FOOT OR PALM OF THE HAND, THE BIG TOE OR THE THUMB.


98
70

ADVANTAGES

A PULSE OXIMETER IS USEFUL IN ANY SETTING WHERE A PATIENT'S OXYGENATION IS UNSTABLE:

- INCLUDING INTENSIVE CARE UNITS (SICU, CTICU, PICU, NICU.
- OPERATION THEATRE AND RECOVERY ROOMS.
- EMERGENCY OR CAUSALITY.

HOSPITAL WARD SETTINGS

AND DETERMINING THE EFFECTIVENESS OF NEED FOR SUPPLEMENTAL OXYGEN

LIMITATIONS

1) OXIMETRY IS NOT A COMPLETE MEASURE OF RESPIRATORY SUFFICIENCY.

A PATIENT SUFFERING FROM HYPOVENTILATION (POOR GAS EXCHANGE IN THE LUNGS) GIVEN 100% OXYGEN CAN HAVE EXCELLENT BLOOD OXYGEN LEVELS WHILE STILL SUFFERING FROM RESPIRATORY ACIDOSIS DUE TO EXCESSIVE CARBON DIOXIDE.

2) IT IS ALSO NOT A COMPLETE MEASURE OF CIRCULATORY SUFFICIENCY

IF THERE IS INSUFFICIENT BLOODFLOW OR INSUFFICIENT HEMOGLOBIN IN THE BLOOD (ANEMIA), TISSUES CAN SUFFER HYPOXIA DESPITE HIGH OXYGEN SATURATION IN THE BLOOD THAT DOES ARRIVE

3) A HIGHER LEVEL OF METHEMOGLOBIN WILL TEND TO CAUSE A PULSE OXIMETER TO READ CLOSER TO 85% REGARDLESS OF THE TRUE LEVEL OF OXYGEN SATURATION.

4) IT WILL NOT SHOW TH STATUS.

5) IT WILL NOT PROVIDE AN ABSOLUTE INDICATOR OF HYPEROXIA.

INACCURATE RESULTS IN FOLLOWING CONDITIONS

- **POOR PERFUSION** (PROCESS OF NUTRITIVE DELIVERY OF ARTERIAL BLOOD TO A CAPILLARY BED IN THE BIOLOGICAL TISSUE).
- **DYSHAEMOGLOBIN (OR)CARBOXYHEMOGLOBIN** Is a stable complex of carbon monoxide and hemoglobin that forms in red blood cells when carbon monoxide is inhaled or produced in normal metabolism.

- **HYPER OXYGENATION**

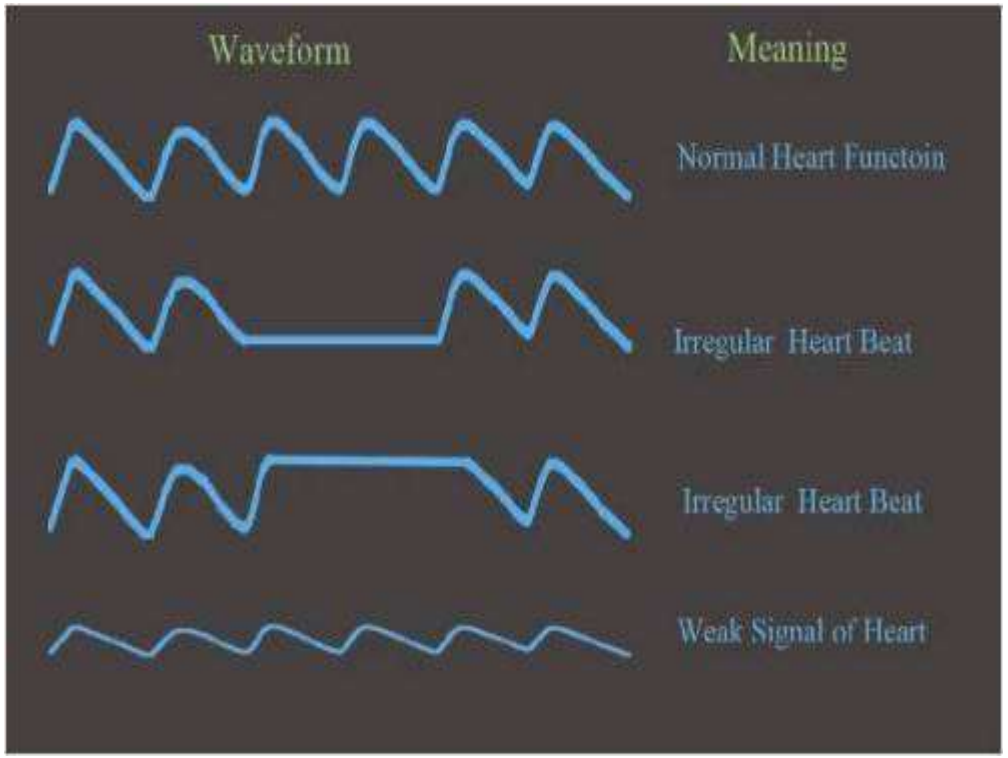
- **ARRHYTHMIA** : **it is An arrhythmia is a disorder of the heart rate (pulse) or heart rhythm, such as beating too fast (tachycardia), too slow (bradycardia), or irregularly.**

- **EXCESSIVE AMBIENT LIGHT**

A PULSE OXIMETER GIVES NO INFORMATION ON ANY OF THESE OTHER VARIABLES

- THE OXYGEN CONTENT OF THE BLOOD.
- THE AMOUNT OF OXYGEN DISSOLVED IN THE BLOOD.
- THE RESPIRATORY RATE OR TIDAL VOLUME I.E. VENTILATION.
- THE CARDIAC OUTPUT OR BLOOD PRESSURE.

THE BLOOD FLOW IS NORMALLY SHOWN AS A WAREFORM USING A BAR OR GRAPH. IT CAN PROVIDE USEFUL INFORMATION REGARDING THE HEART CONDITION.



NURSING RESPONSIBILITIES

PROVIDE THE PATIENT WITH A SIMPLE EXPLANATION OF PULSE OXIMETRY AND ITS VALUE.

SELECT APPROPRIATE SENSOR PROBE FOR PATIENT'S AGE WEIGHT, CONDITION, DURATION OF PULSE OXIMETRY MONITORING, AS WELL AS THE USE OF BP CUFF, ARTERIAL CATHETER AND/OR PERIPHERAL I.V. LINE.

REMOVE ANY NAIL POLISH FROM ANY DIGITS WHICH WILL HAVE A SENSOR APPLIED AS IT INTERFERES WITH LIGHT TRANSMISSION

IF IT SHOWS WRONG READING CHECK PATIENT'S BP AND VITAL SIGNS FIRST – IF THEY ARE ACCEPTABLE FOR PATIENT, THEN CHECK FOR THE FOLLOWING.

- ❑ **Bad Connection**
- ❑ **Inadequate or Intermittent Blood Flow to Site**
- ❑ **Equipment Malfunctions**

AFTER USE:

- REMOVE SENSOR FROM MONITORING SITE.
- WASH SITE OFF WITH SOAP AND WATER.
- (DO NOT USE ALCOHOL).

DOCUMENTATION:

DOCUMENT PULSE OXIMETER READINGS (SAO_2), SENSOR PLACEMENT AND ALARM SETTINGS (CONTINUOUS MODE) ON PATIENT CARE RECORD OR FLOWSHEET.


Thank
You!