



Body Temperature

Medical Measurements Lab 1

Fourth Stage

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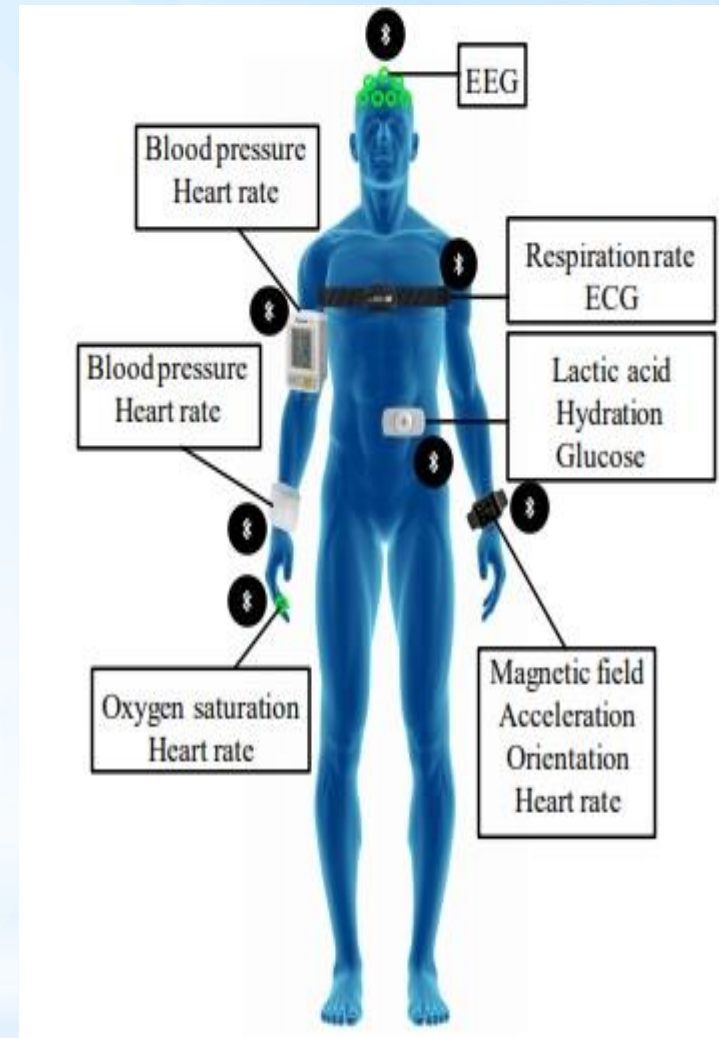
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Types of Health Care Quality Measures



Medical sensors

- Medical sensors are specialized devices designed for monitoring various physiological parameters, collecting data, and providing valuable information to healthcare professionals for diagnosis, treatment, and patient care.
- These sensors play a critical role in modern medicine, enabling continuous monitoring, early detection of health issues, and improved patient outcomes.



Medical sensors

- Here are some common types of medical sensors and their applications:
- **Heart Rate Monitors (HRM):** Heart rate sensors measure the number of heartbeats per minute.
- **Blood Pressure Sensors:** These sensors measure systolic and diastolic blood pressure, helping diagnose conditions like hypertension.
- **Electrocardiogram (ECG or EKG) Sensors:** ECG sensors record the electrical activity of the heart, providing information about the heart's rhythm and any abnormalities
- **Pulse Oximeters:** Pulse oximeters measure the oxygen saturation of blood and the heart rate.
- **Glucose Sensors:** Continuous glucose monitoring (CGM) sensors are essential for individuals with diabetes to track their blood sugar levels throughout the day.

- **Temperature Sensors:** Temperature sensors, such as digital thermometers and infrared forehead thermometers, are used to monitor body temperature, which is crucial in diagnosing fever and infections.
- **Respiration Rate Sensors:** These sensors monitor a person's respiratory rate, which is essential for assessing lung function and detecting breathing problems
- **Oxygen Sensors (O₂ Sensors):** Oxygen sensors measure the concentration of oxygen in gases and liquids
- **Electroencephalogram (EEG) Sensors:** EEG sensors monitor electrical activity in the brain and are used for diagnosing epilepsy, sleep disorders, and brain-related conditions.
- **Pressure Sensors:** Pressure sensors can be used to monitor intracranial pressure (ICP) in patients with head injuries

- **Motion Sensors:** Accelerometers and gyroscope sensors are used in rehabilitation and physical therapy for monitoring patient movements and tracking progress.
- **Magnetic Resonance Imaging (MRI) Sensors:** Specialized sensors are used in MRI machines to create detailed images of the body's internal structures without radiation.
- **Ultrasound Sensors:** Ultrasound sensors emit high-frequency sound waves and receive their echoes to create images of internal organs and tissues.
- **Infrared Temperature Sensors:** Infrared sensors are used for non-contact temperature measurements, making them valuable for monitoring patients without direct skin contact.

Temperature sensor

- A temperature sensor, also known as a temperature transducer or thermometer, is a device used to measure temperature and convert it into an electrical signal or digital output.
- Temperature sensors are crucial components in various applications, including weather monitoring, industrial processes, HVAC (heating, ventilation, and air conditioning) systems, and consumer electronics.
- There are various types of temperature sensors, but I'll explain one of the most common types: the thermocouple



Normal Body Temperature:

- The temperature of the deep tissues of the body which is known as the core temperature remains almost exactly constant except when a person develops a febrile illness.
- On the other hand the skin temperature rises & falls with the temperature of the surroundings.
- The core body temperature can be measured either orally or rectally. The oral temperature is normally 0.5°C lower than the rectal temp.,

Physiological variations in body temperature

1. Normally, the body temp. undergoes a regular circadian fluctuation of about 0.6°C being lowest in the morning & highest in the evening.
2. In Woman there is a monthly cycle of temp. variation characterized by a rise in basal temp. of about 0.5°C at the time of ovulation & during the second half of the menstrual cycle. A similar rise occurs during the first trimester of pregnancy.
3. In children temp. regulation is less precise and they may normally have a temp. that is 0.5°C above the normal for adults.

4. During exercise, excess heat is produced in the body and the rectal temp. can normally rise to as high as 40°C.
5. Emotional excitement slightly increases the body temp. probably due to unconscious tensing of muscles.
6. When the metabolic rate is high the body temp. is chronically elevated by as much as 0.5°C and vice versa but is affected by many factors including ingestion of hot or cold fluids & mouth breathing.

The average normal oral temperature in young adults measured in the morning is 37°C with a range between 36.3 and 37.1 C.

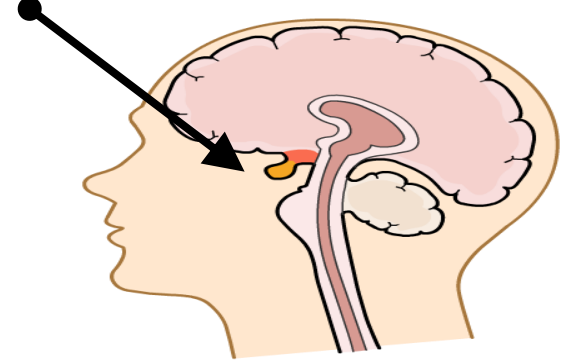
How is temperature controlled?

Body temperature is monitored and controlled by temperature receptors in the skin and brain.

These receptors detect changes in the temperature of blood flowing through those areas

The thermoregulatory centre in the brain is called the **hypothalamus**.

hypothalamus



If body temperature deviates from 37°C , the hypothalamus and skin receptors send out electrical signals that trigger actions or behaviours that increase or decrease heat loss.

1. The anterior hypothalamus-preoptic area : The preoptic & anterior hypothalamic nuclei contain two types of neurons :
A) Heat-Sensitive neurons(receptors) which are present in large numbers. They increase their rate of firing as the temp. rises.

B)Cold-sensitive neurons (receptors) which are less in number than the heat sensitive neurons. Their firing rate increase when the body temp. falls.Both of these types of cells function as temp. sensor for controlling body temp.

2. The posterior hypothalamus : The posterior hypothalamus contains a special area located bilaterally, approximately at the level of the mammary bodies. This area receives signals from the anterior hypothalamus -preoptic area and from peripheral receptors where they are combined to provide mainly the heat producing and heat conserving reactions.

Peripheral receptors for detection of Temperature

These receptors play an important role in temp regulation. They are present in the following sites:

A) The skin :- Where both cold and warmth receptors are present. However, there are far more cold receptors than warmth receptors. Therefore, skin receptors mainly concerns detection of cold rather than warm temp. of the body surface.

B) Deep body tissues :-

Mainly in the spinal cord, in the abdominal viscera, and around the great veins. These receptors detect body core temp. rather than the body surface temperature.

- Yet. Like the skin receptors they detect cold. Therefore, both the skin and deep body receptors are concerned with preventing low body temperatures.

Temp.- regulating mechanisms

- When the body core temp. either increase above or decreases below almost exactly 37° C, several thermoregulatory responses take place to bring it back to this temp. Therefore, this critical temp. level is called the "set-point" of the temp. control system.
- The temp. regulating mechanisms include autonomic, somatic endocrine & behavioral changes. When the body temp. increases above the critical temp,(the set-point in the hypothalamus), one group of these change take place to increase heat loss & decreases heat production.
- On the other hand, when the body temp. decreases below the set point. Another group of change takes place to decrease heat loss & increase heat production



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