NATIONAL INSTITUTE OF TECHNOLOGY
RAIPUR

BIOMEDICAL ENGINEERING

ASSIGNMENT

5 Medical Devices

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1 DIALYSIS MACHINE:

It is used to remove excess water and toxic substances from blood when kidneys are not able to function properly. The first successful Dialysis was done in 1943. If there is less damage in kidney, Dialysis is not recommended but if it starts leading to kidney failure, Dialysis is recommended for survival. It is recommended that when function of kidney is reduced to 10-15

1.1 Working

It slowly draws out the impure blood from patient's body and sends it to a machine called dialyzer. The dialyzer do what a kidney should do i.e. purification of blood. It acts as an artificial kidney and it filters out extra water and toxic substances. The blood which was earlier impure now gets cleaned and it sent back to the body. Thus in this way Dialysis purifies the blood and converts impure blood to pure blood.

1.2 Principle

It works on the principle of diffusion of the solute particles and purifies the fluid through the process of ultrafiltration across semi-permeable membrane.

1.3 Uses

It is a procedure to remove extra water and toxic substances from blood, hence purifies the blood.

1.4 Advantages

It helps in survival of humans when their kidney is not working. It allows a flexible treatment schedule. It can be done when the patient is sleeping.

1.5 Disadvantages

It makes the patient weak. Abnormal Blood Pressure Sleeping Problems

2 AIR PURIFIER:

Air Purifier also known as Air Cleaner is a device is us to purify air by eliminating all the dust, pollutants or other unwanted particles from the air. It is useful for indoor purpose only. This type of devices is very beneficial for patient suffering from Asthma or other type of lung disease as pure form or air is very important for them.

2.1 Working

There is a filter called HEPA which captures the pollutant present in polluted air and as a result gives us a pure and fresh air to breathe. HEPA filter captures the pollutants present in impure air. When polluted or impure form of air is passed through HEPA filter, it traps the pollutants or dust particles in it and gives out pure air.

2.2 Principle

Its working principle is based on Adhesion. Adhesion is the tendency of dissimilar particles or surfaces to cling to one another .

2.3 Uses

The use of air purifier can only be seen in indoor spaces. It takes the impure air inside it, passes it through filtrate, absorbs the impurities present in it and then releases pure air.

2.4 Advantages

It helps in inhaling pure form of air and hence preventing pollutants from entering our body. Keeps us fit and healthy. Protects us from various type of diseases

2.5 Disadvantages

Since it works in indoor systems only, it keeps us away from natural air. It is a high maintenance device Some of air purifiers produce Ozone.

3 BODY SCANNER:

A body scanner is a machine which is useful in detecting objects present inside the body for security purpose. Common application of this device can be seen in Airports. This process of body scanning can be done without removing the clothes or without making any physical contact between persons. There is a special type of X-ray body scanner known as Transmission X-ray body scanner which is capable of detecting objects which are swallowed or hidden in body cavities of a person.

3.1 Working

It works by projecting low level millimetre wave, radio frequency above and around a person body. The radio frequency energy is reflected back from the body and from objects concealed on the body to produce a generic image indicating areas requiring additional search.

3.2 Principle

Millimetre wave scanner uses high frequency radio waves to make an image of the body which shows object hidden under clothes. The backscatter X-ray scanners detect the radiation that reflects from the human body.

3.3 Uses

Identify hidden objects in person's clothes. Also helpful in detecting metal obje

3.4 Advantages

Very useful for security checks. Detects hidden objects inside human body. Whole body gets scanned without removing the cloth

3.5 Disadvantages

Can't detect low density items very well. Its maintenance is very expensive. It also violates privacy.

4 HEARING AID:

It is a device which is very helpful for patients suffering from hearing loss. These type of hearing aids helps the patients from overcoming hearing loss by making sound audible to that patient. It is designed in such a way that it perfectly fits in the ear and is comfortable to wear all the time. If a person is suffering from hearing loss, it is very difficult to communicate with them. In these type of cases, hearing aid plays a vital role.

4.1 Working

Basically what a hearing aid does is it amplifies the sound. It has 3 main parts in it i.e. Microphone, Amplifier and Speaker. The function of a microphone is it receives sound and converts it into digital signal that can be amplified. Amplifier increases the strength of the digital signal or can say it amplifies the signal. And the last part i.e. speaker, produces amplified sound into ear.

4.2 Principle

The principle on which hearing aid works is Sound Amplification. It amplifies the digital signal which is converted from the sound by microphone and increases its strength and then digital signals are converted back into sound by speaker

4.3 Uses

It helps patients suffering from hearing loss to overcome that problem. It helps people hear more in both quiet and noisy situations.

4.4 Advantages

Helps in communication. Sometimes people have chances of conflict since they might hear different thing from the person is actually saying, so hearing aid reduces that. It leads to independent living.

4.5 Disadvantages

Increased sound level can damage the ears more. It is quite costly. It is difficult to use them with phone.

5 OXIMETER:

It is a small and compactable device which is used to measure oxygen level of a person. It measures the proportion of oxygenated haemoglobin in the blood pulsating vessels, especially the capillaries of the finger or ear. During these Covid-19 times, this device was very helpful. If the SpO2 level stays above 92

5.1 Working

A pulse oximeter shines 2 lights through our fingertip or earlobe: one red light and one infrared light. Blood containing oxygen absorbs more infrared light and allows more red light to pass through it. Blood without enough oxygen absorbs more red light and lets more infrared light pass through it

5.2 Principle

It works on the principle of Spectrophotometry. It is a branch of electromagnetic spectroscopy concerned with the qualitative measurement of the reflection or transmission properties of a material as a function of wavelength. The relative absorption of red and infrared light of the systolic component of the absorption waveform correlates to arterial blood oxygen saturations.

5.3 Uses

It is used to measure oxygen level or oxygen saturation of the blood, Basically it tells how well oxygenated our blood is.

5.4 Advantages

Tells that whether our blood is well oxygenated or not Alerts to dangerous low oxygen levels. Assesses the need for supplemental oxygen

5.5 Disadvantages

Cannot be used to assess oxygen delivery (anemia). It is sometimes inaccurate. It is costly. Poor people can't afford it.