IPEM Institute of Physics and Engineering in Medicine

Different imaging modalities with Torso Demo

Equipment

- Life size or smaller torso with removable organs
- Table
- Laptop with presentation and long charging cable. Keeping the cable attached mean the laptop is less likely to go missing or disappear.
- Set of images if no poster available but it does work better with the short videos

Safety / Risk assessment notes

Main danger is the torso falling off the table and causing injury. It is very unlikely though.

The other challenge is putting the organs back correctly after the event 😊

Background

The idea of this demo is to demonstrate how different areas of physics are used in diagnostic imaging. The fun bit is matching the scans to the organs and taking selfies with the open torso.

Details

Tell the participants that the physics and engineering have contributed significantly to medicine and without it imaging to diagnose disease would not be possible.

We are showing you difference non-invasively (non-surgically) methods to look inside the body. All methods are all based on the fact that certain things happen to atoms in our bodies when they absorb energy.

The presentation (or printed images if you prefer to use them) go through a number of different imaging techniques and organs. Ask the kids / participants to identify the organs after they have listened to the explanation of each modality. (So tell them about Ultrasound first, then show them the slides and ask for identification. Then move onto talking about MRI and show them the slides and so on)

Ultrasound - Sound

uses high frequency sound waves to create a live video feed image of the inside of the body. An ultrasound sends sound waves into the body and listens the reflection of the waves

that are bounced back. It can then create a visual representation from this information. Ultrasound is not useful to scan areas with air (like the lung) or bones as air interferes with sound waves.

Images in presentation: Foetal,scan kidney, shoulder ultrasound

MRI - Magnets

uses powerful magnetic field combined with specific radio frequencies. The magnetic fields force most of the hydrogen atoms inside our bodies to align. A specific radiofrequency forces the remaining ones to spin and the machine notes the rates at which these change their orientation. And from that information it can create an image that represents how it looks inside. It is excellent for detecting very slight differences in soft tissues, like tendons and muscles.

Images in presentation: Kidney, heart, stomach and intestines

PET – Radioactive substances

produces images of the body by detecting the radiation emitted from radioactive substances (injected into the body) which show differences in metabolic and chemical activity in the body. An area with increased activity (for example rapidly dividing cancer cells) will show on a coloured image.

Notice that this is a distinct difference from other kinds of imaging - whereas CT and MRI scans look at **structures** in the body, a PET scan looks at **function**.

Images in presentation: Kidneys, Brain, heart, lungs

X-Ray / CT Scanners– Radioactivity

X-rays are a type of electromagnetic radiation, just like visible light. An x-ray machine sends individual x-ray particles through the body.

CT scans use multiple x-rays, taken at different angles, to produce the cross-sectional imaging. Excellent for looking at bones, but not very good for soft tissues.

Images in presentation: Brain, spine, lungs X-ray

Finish off by asking them if they want to take a selfie with the Torso (which still needs a name, so if you or your visitors come up with something please let me know 😊)