CT SCRIPT

Narrator: *CT scanning is a medical imaging technique that combines the use of X-rays and computing power to generate detailed, high resolution 3D images of the body. Ryan is going to show you a little about how CT works and what a patient experiences during a CT scan.*

Ryan: I'm Ryan, and I'm going to show you what happens in a CT scan. CT is a very fast way of getting really detailed pictures of the inside of the body. You might have heard CT referred to as CAT scanning…they are the same thing. I won't actually have the CT done on me since it uses X-ray radiation, but I'll show you what happens to a patient during a head and neck CT. I checked in at the desk of the CT unit and waited for someone to come and get me.

A nurse came and got me in the waiting area. In some cases, nurses will help get patients ready for the scan. ..some patients might need to have special compounds injected to make different things show up in the scan. A technologist came to get me and we went into the treatment room.

N: *In CT, the C stands for computed and the T stands for tomography. Tomography means 'slice-image'…it means that the images it will produce are like 2D slices of the body. Powerful computers can then stack the slices into a 'volume' and construct a 3D image. A typical CT scan uses ionizing X-ray radiation equivalent to roughly 20-100 chest X-rays), which means it can pose a risk to patients…but the risks are small when compared to benefits of diagnosing my problem. The technologists who run the scan also have many strategies for minimizing the dose during scans.*

R: It looks like a giant donut with a bed that goes into it. The technologist explained that the donut houses an X-ray tube and an X-ray detector that will spin around me and send information back to computers in the control room. In a normal X-ray, the X-rays just pass through a person from one side and are detected on the other…this creates a flat image from just one angle. In CT, the source and detector spin around the person…computers can take the images from all of the different angles and build a 3D image out of it.

Once I got comfortable on the bed and the technologist had lined me up in the machine, she placed a lead apron on me to shield my body from unnecessary X-ray radiation. Then she went back to the control room to operate the scan. She would know why a patient's doctor sent them there and would program the scan with a set protocol…they only want to scan areas of interest to keep my X-ray dose low.

N: *Here's where we need to start talking about slicing. As the machine spins, it X-rays a patient from many different angles. If they were looking for a tumour with regular X-ray, we might see it, but you wouldn't really know its three dimensional position inside the body. A CT scan can create slices of the body to show the exact position of things inside a body. The thinner the slice, the better the resolution of the scan and the more accurate the result! Better machines create more slices per area scanned…the machine you see here can create 64 slices with each rotation at a thickness of less than 1mm.*

R: Higher resolution images require higher doses, so they start out with a low-res scan to get a preview of the area. I moved slowly into the machine as this happened…this uses big slices which means less radiation for the patient.

N: *Using the low-res scan, the tech will then create a 'block' to scan which will be sliced according to the final image resolution required. These machines are so sophisticated that they can even control the X-ray exposure based on different tissues encountered in the preliminary scan…for example, the amperage will automatically drop when the machine encounters the lungs and will increase again where higher density structures are found.*

R: The technologist could talk to me from a control room and told me the full resolution scan was about to begin. The machine makes some noise as it spins up, and then I slowly moved through as it scanned my head and neck. The scan was over really fast: the scan of my neck you just saw would only take 5.1 seconds and took 464 pictures! Each of those 464 pictures is one slice that is .625 mm thick! That's about the thickness of a credit card.

N: *All of the X-rays that hit the detector during the scan are sent to computers as data…Here we see 4 views being constructed by the computers…they can put the data together to view a patient any way you like. Here you see an oblique view, an axial view, a sagittal view and a coronal view, all put together by the same data set which was created as the X-rays penetrated the body.*

R: Once the scan was finished, the technologist got me out of the machine and explained that the images they take would go back to the patient's doctor. The computers can manipulate the data from the machine to enhance different structures…think of it like playing around with images from your digital camera on your computer but with incredibly complicated computer processes. Even more incredible is that the computer can stack up all of the slices to create 3 dimensional images and drop different things in and out of the image, like in this scan of the head.

And it just doesn't create pretty pictures! A CT scan can accurately pinpoint tumours or other diseased areas that stand out from the surrounding tissue and create detailed maps for surgeries. These images would then be sent to a radiologist for analysis and their diagnosis will be sent back to a patient's doctor.

N: *X-rays were the first medical imaging technique, and their use has evolved to the sophisticated level of computed tomography. CT eliminates the superimposition of images that occurs in X-Rays and it is the only imaging modality (compared to X-ray, MRI and echocardiography) that allows for noninvasive assessment of coronary artery anatomy. Although it does make use of ionizing radiation, CT still represents one of the most powerful imaging techniques available today.*