ULTRASOUND SCRIPT

Narrator: *Ultrasound is a commonly used diagnostic imaging technique in hospitals and clinics. Because it only uses sound waves to create images, there is no harmful ionizing radiation involved in ultrasound, and it is generally easy and safe for patient. Although ultrasound may not create images as clear to the untrained eye as other diagnostic imaging techniques like CT or MRI, its strength is that it can safely and quickly produce real-time, moving images of many organs of the body as they work. Mark is going to go through an ultrasound procedure to show us how it works.*

Mark: Hi! I'm Mark and I'm going to go through an ultrasound so you can see what it's all about. Here I am checking in at the desk. You've probably heard of ultrasound being used on pregnant women…obviously, I'm not a pregnant woman, so it must have some other uses. It turns out that ultrasound is really good for looking at soft organs and tissues that might not show up in an X-Ray or that might not require the cost of a complicated CT or MRI scan. They are going to do something called 'echocardiography' on me…most people just call it 'echo'…that's an ultrasound of the heart.

After I had checked in, a technologist found me in the waiting room and brought me into an exam room. Normally, there is not much preparation for an ultrasound, just hop up on the bed and take off your clothes from the area to be scanned. As I got changed, she set up the machine, which looks like a giant computer on wheels. She positioned me on the bed so that she would be able to scan my heart properly and then she stuck a couple of sticky pads on me to record the electrical activity of my heart as the ultrasound is done…this can provide some clues to what is going on with the heart. You've probably seen this sort of thing on TV.

N: *Ultrasound works by creating sound waves and detecting their echoes as they bounce off of tissues in the body. The machine has a transducer that looks like a small microphone…it will create the sound waves and receive the echoes. The sound waves we are talking about here are way beyond what humans can hear. Ultrasound of the heart, or echocardiography, can provide information on the pumping function of the heart chambers, the ability of the heart to relax, the presence or absence of fluid around the heart and the integrity of the valves in the heart which are involved in heart murmurs.*

M: So the tech then squirted some gel on my chest…it's kind of cold and slimy, but it will help the transducer slide around and ensure that there is no air between it and me which could interfere with the scan. She moved it around my chest and ribs and images started showing up on the screen.

N: *The transducer needs to be positioned properly for the part of the body being imaged…the technologist will move it around throughout the procedure to direct the sound waves at the appropriate structures and achieve the best viewing angle. The ultrasound signal is reflected by bone, so the transducer is made small enough to send the signal between the ribs.*

The tech will have an idea of where to scan and what images or video sequences to save to the computer. The EKG tracing you see on the screen will also provide some clues, as will heart sounds and pulse measurements, which can all be recorded at the same time. As the transducer moves, it does two things: emits sound wave pulses and receives the echoes of those pulses.

As the sound waves penetrate the body, they encounter different tissues. The strength of the echo (or frequency of the sound wave) that bounces back is based on the density of the tissue that the sound

wave encounters. When a sound wave encounters a change of density, some of the signal will be reflected as an echo, some will be absorbed by the material. When the echo comes back to the transducer, the signal is transformed back into an electrical signal and sent back to the machine. The machine can then calculate the strength of the signal and how long the signal took to return which are mapped out on the screen as intensity and depth. A strong echo will show up white, weak echoes show up black, and everything in between shows up as shades of gray.

M: To put it all together, dense tissues send back 'louder' echoes which show up white on the screen. Softer tissues absorb more of the sound and send back 'quieter' echoes which will show up as shades of grey on the screen.

The technologist showed me something cool: you can even see the blood flowing in the heart across the valves.

N: *The ultrasound machine can make use of the Doppler effect to show the speed of blood flow or turbulent blood flow that may occur at a diseased heart valve. When sound waves encounter moving objects, they echo back at a different pitch, or frequency. If the object is moving towards the listener, the pitch increases. If the object is moving away from the listener, the pitch decreases. Blood should be flowing only in one direction, but in the case of a blocked artery or leaky valve, it will backflow, which will result in blood going in different directions.*
The changes in pitch and the time the echoes take to return are interpreted by the machine and shown in colour: blood flow moving away from the echo beam are assigned a blue colour, and shifts towards the beam are assigned red.

M: It took about 25 minutes for her to scan my heart. She helped me wipe off the gel and I was ready to go! As I left, she said that the recorded images would be sent to a patient's cardiologist or radiologist for examination.

Here is where doctors can analyze the images from the ultrasound. The quick, real-time power of ultrasound is gaining an even bigger advantage over other larger, slower, more expensive imaging techniques…portable ultrasound machines are now being used for doctors to assess patients on the spot! Check out this brand new handheld machine!

N: *Ultrasound is a quick, powerful and safe form of imaging. Its ability to create real-time images of our bodies in action makes it a significant diagnostic tool across many fields of medicine.*