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For me, the most interesting image modality was the CT scan. The first thing that stood out to me about the CT machine was the sheer size it occupied within a room. It had almost an imposing presence that made it seem larger than life. However, from a technical standpoint, I was very impressed by how quickly it could perform, painless, non-invasive imaging in mere seconds while producing incredibly high-resolution images that can be easily interpreted by a radiologist, while simultaneously reducing the need for a re-scan. Another thing that interested me about the Siemens CT scan machine is how accessible it can be because of its speed. Reducing the need for a rescan if a patient is not perfectly positioned because of a say a stroke.

The most interesting application of biomedical imaging I saw was the performing of an angiogram on a patient. I thought it was very interesting how a live x-ray video feed could be relayed to doctors with high resolution and accuracy for such small components of the body, specifically blood vessels. What fascinated me about it, was how hyper-optimized everything was from the positioning of the tools in the room to the doctor's ability to bounce between the operating room and the visuals room in real-time, while being able to work with their patients to optimize the image collection experience.

I experienced a real scan of a patient in a Siemens CT scan machine. They initially were given a dye intravenously to improve contrast, and then they were placed flat on a table that was machine operated which positioned the patient within the scanner for imaging, being controlled by the technologist from the control room. From our discussion with the radiology technologist, patient positioning is crucial because it reduces the generation of motion artifacts and maximizes image quality. Moreover, in cases where the patient is in pain, finding positions that are comfortable yet yield a high-quality image is ideal because they make the overall process go more smoothly without the need for retaking the image because of pain-induced movement artifacts generated by uncomfortable positioning.

Alongside patient positioning, standard operating procedures are essential for two main reasons: consistency in both image quality and accuracy, and safety. By following standard operating procedures a technologist can ensure that every patient is imaged the same way according to the specific part of the body that is needed. This reduces the need for retakes as the radiologist knows what to expect from each image. However, from a safety standpoint following a rigorous operating procedure reduces risks such as excessive radiation exposure, and ensures that all parties involved are safe.

One difficulty we discussed was the need for consistent recalibration and quality control of imaging machines such as SPECT/CT machines to ensure that the image generated is not warped during real examinations. In order to recalibrate and perform quality control tests, a machine is imaged with a lead-lined sheet and an algorithm is required to calculate the linearity compensation. Not only is this time-consuming, creating downtime for a machine. But even with calibration there still exists very slight degrees of warping (wavy lines) on the linearly corrected imaging. Therefore development in this area would serve the imaging field well as it would yield a lower need for machine downtime, while also increasing the quality of the images produced.

One advancement and research development regarding the CT modality is the advancement in low-dose CT scans. These advancements are spearheaded by both advancements in hardware and software. From the hardware side, low-dose CT scans are the result of more advanced X-ray detectors that can capture more information with lower radiation exposure while still maintaining high resolution due to their increased sensitivity. From the software side, advancements in software algorithms allow for the digital reduction of noise, alongside this the introduction of deep learning algorithms that compensate for a reduction in exposures taken, can reduce the amount of radiation a patient is exposed to as well.

Overall the tour of Foothills was a wonderful experience that gave me the opportunity to see in real-time the various modalities I have spent the past semester learning about. I thoroughly enjoyed asking questions of the technologist and various personnel on the tour, and seeing how the fundamental principles of imaging come to fruition in practice.