This episode discusses the main differences between some of the most common diagnostics bedside nurses will encounter.

**X-Rays**

- One of most common diagnostic studies
- Uses radiation to view dense objects in body (ie bones, organs, tumors)
- Can normally detect fractures, dislocations, some tumors, infection)
  - Chest x-rays, abdominal x-rays can detect things like air, fluid, edema
- Usually 1 x-ray image is from one view
  - If multiple views are needed, multiple x-rays are taken
  - Anterior, posterior, lateral, medial, etc
- Some can be done at the bedside (frequently called a “portable x-ray”), while others must be done in the radiology department (therefore the patient must travel from their room, to radiology)
  - This can be challenging in setting where patients are not stable enough to travel
- Special considerations should be taken if patient is pregnant. Nurses who are pregnant should keep safe distance from x-rays especially portable x-ray machines.
CT Scans

- Computed tomography
- Uses higher levels of radiation to obtain more high quality images of the body
  - One CT is the equivalent of 200 x-rays in terms of radiation exposure (source)
  - Pregnant women should not have a CT unless life-threatening due to the amount of radiation
  - Medical staff should not be in room while scan is running to avoid exposure
    - If the patient is ventilated and needs a CT, the patient ideally should be on a portable ventilator so the respiratory therapist or nurse doesn’t have to be in the room, bagging the patient while they are getting the scan
    - If medical staff have to be present (like a respiratory therapist who is manually bagging the patient), they should wear proper lead barriers
  - Don’t just get a CT just to get it due to the high amount of radiation, only get one when truly needed
- Allow for images from various view points, much more detailed than an x-ray
Better for diagnosing problems such as masses, cancer, internal bleeding, clots, fluid in organs, infection
Take as little as 30 secs up to several minutes - it's quick!
A CT can be performed with or without contrast - important to know this
  - If the patient is getting IV contrast during CT Scan, the pt should have a recent Creatinine level
  - The dye is metabolized through the kidneys and can be dangerous for patients with renal compromise
  - If the patient is on Metformin, typically additional IV fluids and meds are given, and a few doses are held, as it is particularly hard on the kidneys when combined with contrast
  - Read your orders! These instructions are usually nursing communications/notes and can be easily overlooked.

**MRIs**
- Magnetic resonance imaging
- MRI’s use a powerful magnet to produce detailed, high resolution images of organs, bones and tissues in the body.
  - Since the test involves a powerful magnet, it’s important to know if the patient has any metal in the body, pacemaker, implants, bullets, shrapnel, and anything else with metal
  - Patients often go through a screening process prior to the study so if the patient is unable to report their history, a knowledgeable family member or patient representative should be available.
- An MRI does **not** use radiation, it uses a *magnet*
  - A big old magnet
- This exam is useful in detecting bone, joint, ligament, cartilage issues, spinal disc problems, tumors, ischemic tissue
  - High resolution, great pictures
- These tests take several minutes to **hours** to perform
- Patients must have to lie very still in a long tube for an extended period of time.
  - Patients who are claustrophobic often have difficulty completing the study and may require sedation or anesthesia
  - Nurses should try to determine if pt will tolerate test
- Frequent patient question: “Why did I have a CT scan when I could have had an MRI?”
  - MRI’s take much longer and are are much more expensive
  - Scanners could have been down, it could take hours to get the exam done (like if it were of the spine), it could have taken hours to get the results read, the patient could have required sedation and that may not have been medically appropriate, and/or if it’s a time sensitive issue (like a stroke), there simply isn’t enough time to get an MRI completed to make appropriate medical decisions
Because it's a magnet, you can't just walk into the MRI room
  - You have to remove any metal from your person (like cell phones, credit cards, pens, bobby pins, jewelry, badges)
  - Make sure the patient doesn't have any metal on and monitoring is removed
    - No O2, regular IV pumps, regular beds/stretchers
    - A funny video of people trying to pry a chair off of an MRI magnet: https://www.youtube.com/watch?v=4uzJPPc4Wuk
    - *Wheelchair ended up STUCK to MRI machine after eager family pushed it into the treatment room too soon in a move that could have cost them up to £300,000*

Open MRI's - larger opening for patients who do not physically fit into the MRI scanner
  - You may need to measure the patient's waist before traveling down to the scanner
  - MRI tech’s may automatically come up to measure the patient when they see a patient weights over a certain amount.

### Angiography

- Angiography involves visualizing certain vessels in the body either with the use of CT or a special x-ray called fluoroscopy
- Usually an angiogram in interventional radiology (IR) is performed by a radiologist at the bedside
- It involves direct visualization of vessels by a small catheter placed in the groin that is injected with contrast dye
- Radial, femoral approach
- Typically patients will have this particular study in IR to diagnose or possibly treat any abnormality that is seen with the vessel
  - Stenting a narrowed carotid artery - cardiac cath with intervention
  - Placing a filter in the inferior vena cava to prevent passage of blood clots to lungs
- Nursing considerations
  - NPO at least 6 hours prior
  - Patients are sedated for this procedure (conscious sedation typically rather than general anesthesia), therefore aspiration could be a risk
  - HOB flat after the study is performed to allow for hemostasis to be achieved at the puncture site
  - Assess for flank pain, hematoma, retroperitoneal bleed, or re-bleeding of the puncture site
  - Close monitoring of vitals, puncture site, and pulses distal to the puncture site post-procedure
Nuclear medicine

- “Nuc-med”
- Nuclear medicine studies involved an injected (IV, PO) radioactive isotope to visualize an organ's function
- Common examples are nuclear stress test (cardiac), V/Q Scan (PE), PET Scan (cancer)
- Used to help diagnose heart disease, gastrointestinal disorders (GI bleeds in particular), cancers (for example, bone cancer), gallbladder disease, pulmonary embolism
- Nuclear med technologists assist in handling the radioactive isotope and injection into the patient
- Planning is key between the time the isotope is injected and when the scan occurs
- Nurses who are pregnant should not work with or care for these patients who are undergoing these studies