

**DIAGNOSTIC
RADIOGRAPHY AND QUIZ**
Medical Student Workbook

Author: Clare Hawkins

Superintendent Radiographer

What is it?

- Radiography is the practice of using ionising radiation to produce diagnostic images of the body.
- The ionising radiation is used under specific guidelines and is strictly regulated.
- An x-ray tube produces the radiation and an imaging receptor manipulates the radiation it detects and produces an image via a computer.

Radiographers? Who are they?

- Radiographers are BSc Hons Health Care Professionals who have studied radiography for 3 years.
- Their role is multifaceted.
- They are responsible for producing diagnostic images, justifying any requests made for radiographic imaging and ensuring the produced images are of sufficient quality to be diagnostic whilst the radiation dose remains as low as reasonably achievable.

Radiographers? Who are they?

- They:
 - Work with radiologists to produce images for procedures using radiation.
 - Act as the gatekeeper to the radiology service.
 - Liaise with radiologists and other specialties to assess the most appropriate imaging to demonstrate the anatomy/pathology necessary.

Radiographers? Who are they?

- They are:
 - Highly skilled in the physics of the x-ray tube and the manipulation of the radiation required to produce the diagnostic image.
 - Have high level anatomy knowledge and know how to x-ray every area of the body.
 - Are responsible for the radiation the patient is exposed to and any others who may be in the area.

Radiographers? Who are they?

- There are many specialist areas within radiography.
- Radiographers can choose to specialise in plain film, trauma, fluoroscopy, cross sectional imaging, cardiac, nuclear medicine, interventional radiology, paediatrics and image interpretation, as advanced practitioners, to name a few.
- Many specialists have post graduate qualifications.

Referrer, Operator, Practitioner?

- A referrer is the individual that requests the radiation exposure and therefore must provide enough clinical information for the exposure to be justified.
- The practitioner is the person responsible for justifying the radiation exposure.
- The operator is responsible for carrying out the radiation exposure.
- The practitioner and the operator can be the same person. Often this is the radiographer for plain film imaging.

Referrer, Operator, Practitioner?

- If a request cannot be justified it will be returned to the referrer for additional information or may be declined.
- An operator cannot irradiate a patient if the radiation exposure cannot be justified. This is a legal requirement.
- The Royal Collage of Radiologists (RCR) Referral Guidelines [irefer : Making the Best Use of Clinical Radiology](#) are used to aid justification of requests for radiology.

How do you take an x-ray?

- Radiation is produced when a high voltage current is applied to a vacuum x-ray tube.
- A cathode releases electrons which are accelerated across the tube to a rotating anode.
- When the high velocity electrons collide with the spinning anode target, radiation is produced of energy equivalent to the voltage applied to it.
- This voltage is KVP and is the penetration of the x-ray beam.
- The current is the mA .
- mA and time is combined as MAS and this controls the amount of radiation released by the tube.
- The time must be very short to reduce the risk of movement on the image.
- The radiographer controls the exposure factors to produce the best quality image and keep radiation dose as low as reasonably possible (ALARP).
- Patient age, size and body part all influence the factors chosen.

How do you take an x-ray?

- The radiation passes through the body part. The KVP describes the maximum voltage and there will be a range of radiation of lower energies. A percentage will be absorbed within the patient and a percentage will pass through the patient.
- The percentage that passes through will produce the image. The percentage that is absorbed will contribute to the radiation dose the patient receives.

How do you take an x-ray?

- A receptor plate will detect the radiation that has passed through the patient and produce an image.
- Where radiation passes through the body part the image will be black, where it has been absorbed by the body part it will be white.
- Provided the correct exposure factors were selected, all the tissues densities in between should appear grey depending on their density.

How do you take an x-ray?

- The imaging receptor is then “read” in a processor and energy received by the plate is manipulated into an image.
- The discrete energy units are recorded on the final images in pixels and visible as an image on a screen.

How do you take an x-ray?

- The image can be manipulated at this point by the operator to produce the most diagnostic image. This is then sent to PACS for viewing.
- This system is not a perfect representation of the body part image. Many factors will affect the quality of the image seen.
- Viewing stations vary in quality and this in turn will affect the ability to assess the final image. That is why radiographers and radiologists often work in the dark!

How Do You Take an X Ray?

- Many factors affect the ability to produce diagnostic images. There is a specific technique for every single body part. These are always based on ambulant patients who can cooperate and who are of average build and bone density. The skill of the radiographer is to produce the same quality image every time, irrespective of how the patient presents, their body size and their pathology.

How Do You Take An X Ray?

- It is essential that the radiographer knows all the relevant information to produce the best quality image.
- What the referrer wants to know is the best possible information. History about the patient is also essential. By knowing what needs to be demonstrated the radiographer can ensure the most appropriate images is produced.
- There is never any benefit of irradiating a patient if there is no diagnostic value. If an x-ray will not change the management of the patient it will not be performed.
- If the patient is unable to cooperate in any way and it is not possible to produce a good quality image, it will not be performed.

Governance

- Governance varies through NHS trusts in the UK and some radiographers produce written reports on the images they have produced.
- Whether they can or cannot do this, a radiographer can always offer an opinion on an image and imaging technique.
- Having seen and produced thousands of images over their careers they are often an underutilised and valuable resource.

Quiz

1. Which fish bones are visible on x-rays and why?
2. What is the dose of a chest radiograph, abdominal radiograph, hand radiograph, CT abdomen, contrast swallow?
3. What are the background radiation dose equivalents to the above?
4. What is the advantage of a high KVP chest x-ray technique?
5. What is the difference between CR and DR radiography?

Quiz

7. What is the impact on radiation dose to the general public of the above?
8. What are the radiographic signs of a bowel perforation on a supine abdominal radiograph?
9. How would you know the difference between a PA and AP chest radiograph and why would you need to know?

Quiz

10. What are IRMER and IRR99? What is the difference?

11. What is the patient identification protocol prior to ionising radiation exposure?

12. What is the name of the council responsible for the registration of radiographers?