S11 Is 6 Feet a Safe Enough Distance for Mobile Studies?

Objectives

1. Define and explain radiation depletion, the three cardinal principles of radiation protection (time, distance, shielding), and the process of Compton scatter.
2. Apply the principles of radiation protection to determine the safety of standing 6 feet away from a portable x-ray machine during an exposure.

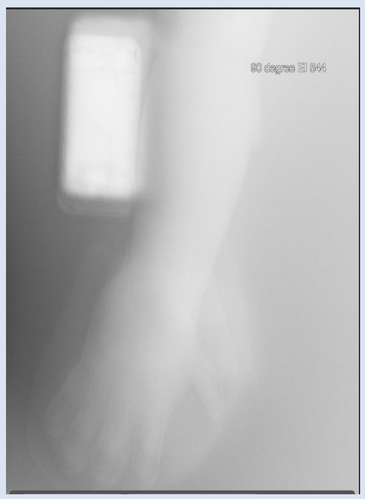
Radiation Depletion and the Three Cardinal Principles

As we increase our distance, we decrease the intensity of the x-ray beam/photons. Distance and intensity are INVERSELY proportional. Therefore, the further away from the portable when taking the exposure, the less dose technologists will receive.

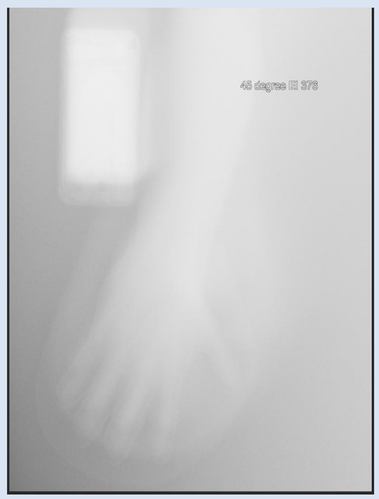
Time, Distance, and Shielding. The less time spent near the source of radiation, the less dose received. The greater the distance from the source, the less dose received.

Experiment

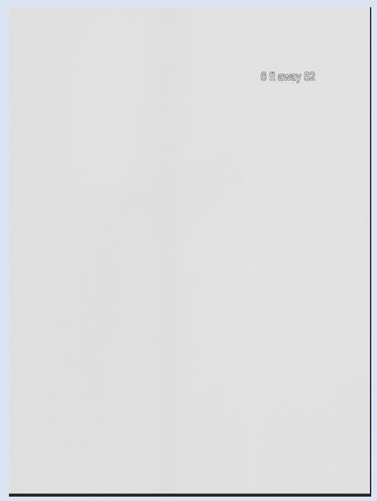
- Set up the stretcher for an AP Portable Upright Chest X-ray with the CR to match the sternum and create as much distance as possible between patient and tube (aim for 72 inches)
- Position the IR with phantom hand 90 degrees to the tube to simulate holding (#1)
- Position the IR with phantom hand 45 degrees to the tube to simulate holding (#2)
- Measure and position IR 6 feet away from the tube with phantom hand placed on top (#3)
- Observe how much scatter is reaching the hand



#1



#2



#3

Research Techniques

- Tech at 90 degrees holding pt: 100 kVp, 5 mAs, EI: 544
- Tech at 45 degrees holding pt: 100 kVp, 5 mAs, EI: 376
- Tech standing 6 feet away from tube: 100 kVp, 5 mAs, EI: 52

Compton Scatter

- Two types of interactions in X-ray: Photoelectric and Compton Scatter
- Compton scatter causes the most exposure to the tech since photons from the primary beam are deflected from the primary path (causing "scatter" radiation)
- The amount of scatter depends on multiple factors such as technique, patient thickness, light field size, etc.

Conclusion

We believe that 6 feet away is far enough. Obviously, if possible, we should try to increase our distance as much as we can to minimize the amount of dose we are receiving.

From our research and experiment, we can conclude that when you stand at least 6 feet away your dose exponentially decreases and keeps decreasing the farther you are away from the tube.