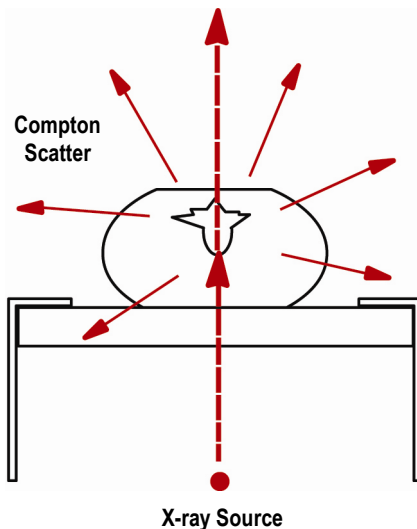


# Safe and Efficient Use of the C-Arm Fluoroscope

Portable fluoroscopy units, such as the C-Arm used in surgery, are notorious for very high levels of radiation both to the patient and also to the physician and assistants. We are all aware that we need to avoid the direct x-ray beam in order to avoid excessive radiation exposure. However, **some physicians may be unaware of the risk of the scattered radiation.** Over-exposure has occurred when the physician was unaware of the source of the scattered radiation. When an x-ray source strikes a target such as depicted in the drawing, scattered radiation is initiated. This is called Compton Scatter and it occurs at every interface and radiates in all directions. The two major sources of scatter radiation are the x-ray source and the patient.



Radiation protection philosophy is best summarized in the acronym ALARA, i.e. the radiation dose should be kept **As Low As Reasonably Achievable**. The three variables that can be manipulated to reduce radiation exposure are shielding, time and distance. The mnemonic STD will help you remember to practice SAFE RADIATION!

## ALARA

*Radiation doses should be kept **As Low As Reasonably Achievable***

## To Achieve ALARA

1. Increase Shielding
2. Decrease Time
3. Increase Distance

The best way to limit the time is for the physician, and not the x-ray technician, to use the C-Arm foot switch. Proper positioning of the C-Arm also eliminates parallax error, thus making placement of the needle and centering of the spinal core stimulator lead much less difficult, which in turn minimizes the total fluoroscopy time.

Significant protection can be afforded by positioning the radiation source under the patient for two reasons. First it moves the x-ray tube (one of the primary sources of scattered radiation) away from your radiation sensitive organs, i.e. eye lenses, thyroid, lungs, breast and stomach. Secondly, the radiation exposure decreases as the reciprocal of the distance squared. Thus, every time you double the distance between you and the x-ray source, you will decrease your radiation exposure by a factor of four! Consequentially, the only safe way to position the C-Arm is with the x-ray source under the table. This not only maximizes the distance between your eyes and the x-ray source, but it also allows for a simple way to shield the radiation.

**In addition to wearing the lead aprons, those individuals that are often close to the x-ray source should wear x-ray attenuating gloves, a thyroid shield and x-ray attenuating glasses.**