Math Equations for Fluoroscopy

Minification Gain

- In the image intensifier
- Represents the increase in output image brightness (at the output phosphor) as a result of reduction in image size

$$\frac{\text{Input phosphor size}^2}{\text{Output phosphor size}^2}$$

Total Brightness Gain

- In the image intensifier
- Need flux gain from the manufacturer
  - Increase in output image brightness expressed as a ratio of the number of light photons at the output phosphor to the number of light photons produced at the input phosphor

Total Brightness gain

TBG = Flux gain x Minification Gain

Dose Change with Magnification

- Anytime the unit is switched from normal mode to magnification mode, there is an increase in patient dose
- Normal mode is ALWAYS represented by the largest number given as it is the size of the input phosphor
- Unless the size of the output phosphor is given, assume it is 1” (2.5 cm)

Dose Change with Magnification

- If switching from magnification mode to normal mode, the dose will decrease
- In either case, the formula stays the same
- The number represented is the degree of change – there are no qualifiers

$$\frac{\text{Normal Mode}^2}{\text{Mag Mode}^2}$$

Inverse Square Law

- Any time distance from an x-ray source is changed, there is an effect on patient dose
- Changing distance will have the most profound impact on dose

$$\frac{Intensity_1}{Intensity_2} = \frac{Distance_2^2}{Distance_1^2}$$