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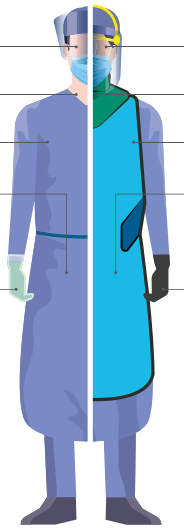
KNOWLEDGE FLASH

Hand Protection from Scattered Radiation

While traditional intraoperative fluoroscopy protection relies on thyroid shields and aprons, recent data suggests that the surgeon's eyes and hands receive more exposure than previously known.[1] Surgeons may be at greater risk for radiation exposure when fluoroscopy is used in hand surgery than in other surgical procedures due to the need to manually position the extremity for imaging. Given the uncertainty regarding long-term hand exposure, radiation-attenuating surgical gloves (RAGs) play an important role in decreasing the potential cumulative risk of long-term subclinical exposure.[2]

EXPOSED[1]	WHICH SIDE ARE YOU ON?	SHIELDED[1]
4.1 µSv to eye		Reduced by approx. 65%
1.6 µSv to thyroid		Reduced by approx. 25%
2.0 µSv to chest		Reduced by approx. 35%
1.9 µSv to groin		Reduced by 32%
31.0 µSv to hand		Reduced by 69.4%



19.4x GREATER HAND EXPOSURE COMPARED TO THYROID

15.5x GREATER HAND EXPOSURE COMPARED TO CHEST

HANDS HAVE UP TO **13X GREATER** EXPOSURE TO THE SUM TOTAL OF OTHER BODY PARTS[1]

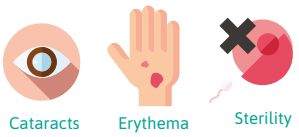
Results are based on a study[1] using a distal radial fracture surgery model to examine rad iation exposure to the eyes, thyroid, chest, groin and hands of a surgeon mannequin, with and without shielding equipment. The C-Arm fluoroscope was vertically positioned and set at 60 kVp.

STANDARD SURGICAL GLOVES **ATTENUATE UNDER 1%** OF SCATTERED RADIATION[2]

Measurement used: Sievert (Sv) is the unit of radiation absorption in the International System of Units (SI). Since one sievert represents a massive dose, most measurements are done in either millisieverts (mSv = 1/1000th of a sievert) or, more commonly, microsieverts (µSv) = one millionth of a sievert.

YOUR RADIATION EXPOSURE RISK

DETERMINISTIC EFFECTS[3]
- Dose dependent – occur above a threshold
- Severity increases with dose



STOCHASTIC EFFECTS[4]
- Not dependent on threshold dose
- No radiation dose considered safe for radiation protection purposes

PRACTICE ALARA

AIM TO STAY **AS LOW AS REASONABLY ACHIEVABLE**

TIME: The shorter the time spent near a radiation source, the lower the risk of exposure

DISTANCE: The closer to the radiation source, the greater the risk of harmful consequences

SHIELDING: Increasing the shielding around a radiation source decreases the exposure

References:

1. Hoffler CE, Ilyas AM. Fluoroscopic radiation exposure: are we protecting ourselves adequately?. J Bone Joint Surg Am. 2015;97(9):721-725.
2. Wagner LK, Mulhern OR. Radiation-attenuating surgical gloves: effects of scatter and secondary electron production. Radiology. 1996;200(1):45-48.
3. Coeytaux K, Bey E, Christensen D, Glassman ES, Murdock B, Doucet C. Reported radiation overexposure accidents worldwide, 1980-2013: a systematic review. PLoS One. 2015;10(3):e0118709. Published 2015 Mar 19.
4. Kaplan DJ, Patel JN, Liporace FA, Yoon RS. Intraoperative radiation safety in orthopaedics: a review of the ALARA (As low as reasonably achievable) principle. Patient Saf Surg. 2016;10:27. Published 2016 Dec 12.

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