

In-room Radiation Shielding – A Quick Guide

Fluoroscopically guided interventional procedures result in unavoidable staff radiation exposure.

Whilst PPE should always be available and worn as a primary source of protection, there are a number of products on the market that can provide additional levels of protection from scatter radiation.

The correct positioning of such devices is paramount in providing the optimum levels of protection, but as procedures and practices vary, it is difficult for manufacturers to offer specific guidance on how they should be used.

What is In-room Radiation Shielding?

Radiation shielding is commonly a lead, lead-free composite or lead impregnated plastic or glass item that is suspended on something other than an individual. Commonly they are either table mounted, ceiling mounted or on their own free standing base. They usually have a lead equivalence of at least 0.5 mm Pb, but this may vary depending on the application.

Basic Principles:

All radiation shielding should be placed between the radiation source and the operator and as close to the scatter source as possible.

Types of Shielding:

Upper Body Shields: Ceiling Mounted Shields

These are often leaded PMMA screens and are available in a number of sizes and configurations, sometimes including cut-outs and lead curtains. Results from a study conducted by Miller et al [1], indicate that more than 80% protection can be achieved when an upper body shield **is placed close to the operator and tight to the patient surface**. However, poor placement of the upper body shield results in minimal protection.

Radio-Protective Sterile Drapes

These surgical drapes are a relatively new innovation, designed to help reduce radiation dose to operators. In a study by King et al [2], they were shown to offer a dose reduction of 12-fold for the eyes, 25-fold for the thyroid, and 29-fold for the hands when the radiation-attenuating surgical drape was used when compared with control studies performed with a standard non-attenuating surgical drape alone. **Positioning of these products is quite specific as they are often fenestrated for certain interventional procedures**. Miller et al [1] suggest that whilst these drapes offer a dose reduction, it is no substitute for properly placed upper body shielding.

Lower Body Shields: Table Mounted

An under-table X-ray tube can result in significant scattered radiation to waist and lower limbs of operators. Table-suspended drapes or lead curtains between the X-ray tube and the operator can provide suitable protection. The effectiveness of these devices is well documented. **The positioning of the shield should be between the operator and the x-ray tube**. The closer to the x-ray tube, the less 'in room' scatter will be present. In instances where there are multiple operators other products are available that extend the lower body protection around the table.

Flexible Mobile Shields

Mobile screens follow the same principle as table-mounted screens. The added benefit is that they can be positioned more freely around the interventional table and they can be raised higher than the table to provide additional upper body protection. However, a wheeled base does have a 'footprint' and its positioning may need to be considered.

References and further reading

1. Miller DL, Schueler BA, Fetterly KA and Hindal MD. Effective Use of Accessory Radiation Shielding Devices in Fluoroscopy. *RadioGraphics* 2021; 41:E18–E19. doi: 10.1148/rg.2021200074.
2. King JN, Champlin, AM, Kelsey CA and Tripp DA. Using a sterile disposable protective surgical drape for reduction of radiation exposure to interventionalists. *Am J Roenthenol.* 2002 178(1):153-7. doi: 10.2214/ajr.178.1.1780153
3. Biso SMR and Vidovich ML. Radiation protection in the cardiac catheterization laboratory. *J Thorac Dis.* 2020 Apr; 12(4): 1648–1655. doi: 10.21037/jtd.2019.12.86
4. Sciahbasi A, Sarandrea A, Rigattieri S, et al. Extended Protective Shield Under Table to Reduce Operator Radiation Dose in Percutaneous Coronary Procedures. *Circ Cardiovasc Interv.* 2019 Feb; 12(2):e007586. doi: 10.1161/CIRCINTERVENTIONS.118.007586
5. Shortt CP, Al-Hashimi H, Malone L and Lee MJ. Staff radiation doses to the lower extremities in interventional radiology. *Cardiovasc Intervent Radiol* 2007; 30(6):1206-9. DOI: 10.1007/s00270-007-9071-0
6. Meisinger QC, Stahl CM, Andre MP et al. Radiation protection for the fluoroscopy operator and staff. *AJR* 2016; 207(4):745-754. DOI: 10.2214/AJR.16.16556