

# Ask EuroSafe Imaging Tips & Tricks

## IR Working Group

# Occupational Radiation Protection in Interventional Radiology

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## Introduction

- The number of interventional radiology (IR) procedures is constantly increasing worldwide
- There is wide variation in radiation dose received by the patient and interventional radiologist for specific procedures and among different procedures
- The radiation risk for the patient is almost always significantly less than the other procedural risks
- Radiation protection requires reasonable training and education for the radiologist and the availability of protection tools

## Radiation Protection Tools

- The greatest source of radiation exposure to the operator and staff is scatter from the patient → reducing patient dose also reduces scatter and lowers operator dose
- Shielding: equipment mounted shields, architectural shielding and personal protective devices
- Personal Protective Devices: aprons, thyroid shields, eyewear, and gloves
- Recording: use dosimeters to monitor operator exposure

# Radiation Protection Tools

## RIGHT



- Right positioning to avoid scatter behind the gantry
- Full set personal protective devices

## WRONG



- Wrong positioning, no protection against scatter

## Dosimeter Use

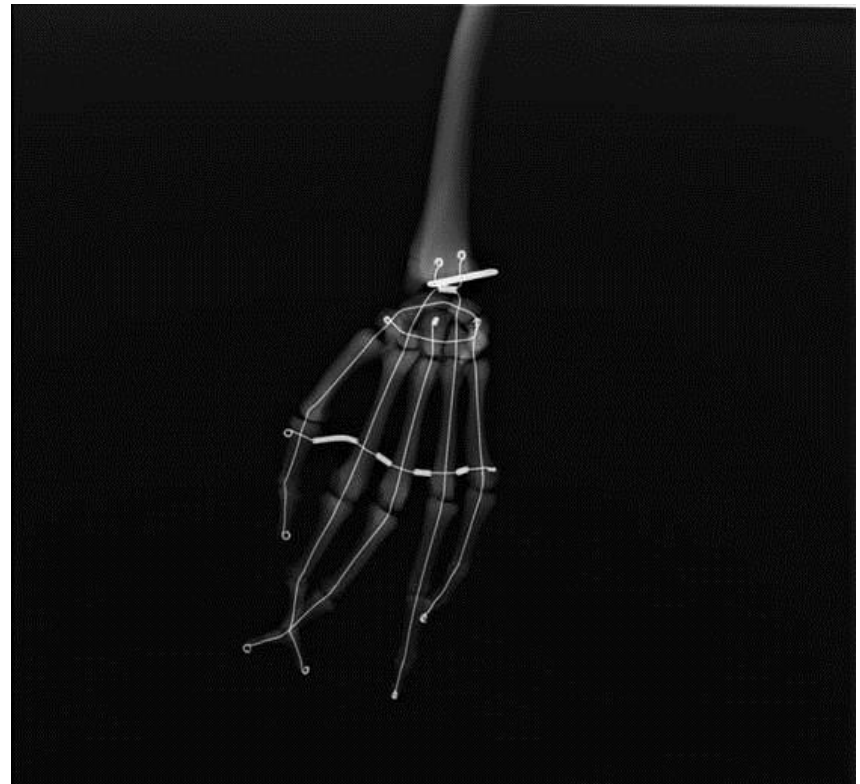
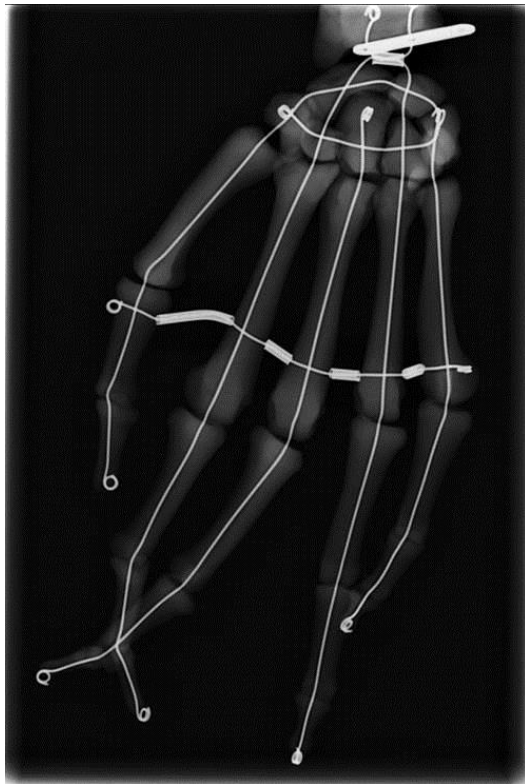
- Monthly monitor replacement is recommended to identify high personal dose and to initiate work habit changes
- The ICRP recommends two dosimeters, one under the apron and one at collar level
- Hand doses should also be monitored, using an additional ring dosimeter
- The WHO recommends investigation when monthly exposure reaches 0.5 mSv for effective dose, 5 mSv for dose to the eye lens or 15 mSv to the hands

## Practical Advice to Reduce the Occupational Radiation Dose

- Use collimation
- Minimize fluoroscopy time and number of fluoroscopic images
- Use protective shielding
- Use all available information to plan the interventional procedure
- Position yourself in a low-scatter area
- Use good imaging-chain geometry
- Obtain appropriate training

## Practical Advice to Reduce the Occupational Radiation Dose

- effective use collimation
- Dose area product: 0,03 mGy·cm<sup>2</sup>
- ineffective use collimation
- Dose area product: 0,26 mGy·cm<sup>2</sup>



# Practical Advice to Reduce the Occupational Radiation Dose

## Use collimation

- Adjust collimator tightly to the desired field of view
- Collimation reduces patient dose and improves image quality by reducing scatter

## Minimize fluoroscopy time and images

- Fluoroscopy only to observe objects or structures in motion
- No fluoroscopy to determine or adjust collimator blade
- For digital subtraction angiography, use variable frame rates tailored to the examination



# Practical Advice to Reduce the Occupational Radiation Dose

## Use protective shielding

- Wear personal protective aprons, thyroid shields, eyewear, and gloves
- Ceiling-suspended shields and under-table lead drapes reduce dose exposure of the operator substantially

## Use all available information to plan the interventional procedure

- Use pre-procedure imaging (CT, MRI or US) to define the relevant anatomy and to plan the interventional procedure

# Practical Advice to Reduce the Occupational Radiation Dose

## Position yourself in a low-scatter area

- Inverse square law is key to radiation protection
- Step out of the procedure room during fluoroscopy whenever feasible
- Never place your hands in the X-ray beam

## Use good imaging-chain geometry

- X-ray tube as far away as possible from the patient
- X-ray detector as close as possible to the patient

# Practical Advice to Reduce the Occupational Radiation Dose

## Obtain appropriate training

[European Curriculum and Syllabus of Interventional Radiology](#)

Certified Expertise:

### **European Board of Interventional Radiology (EBIR)**

The EBIR is organised with endorsement and under supervision of CIRSE (the Cardiovascular and Interventional Radiological Society of Europe), the ESR (European Society of Radiology) and the UEMS Interventional Radiology Division.