

Ask EuroSafe Imaging Tips & Tricks



Interventional Radiology Working Group

How to control or reduce patient doses during IR procedures

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Establishing a patient safety programme in Interventional Radiology (IR)

There has been continuous development in endovascular surgery over recent years. The advantages of this type of treatment are undeniable, since it offers:

- ❑ Reductions in length of hospital stay;
- ❑ General anesthesia usually is not required;
- ❑ Reductions in the volume of blood lost by patients;
- ❑ Risk, pain and recovery time are significantly reduced.



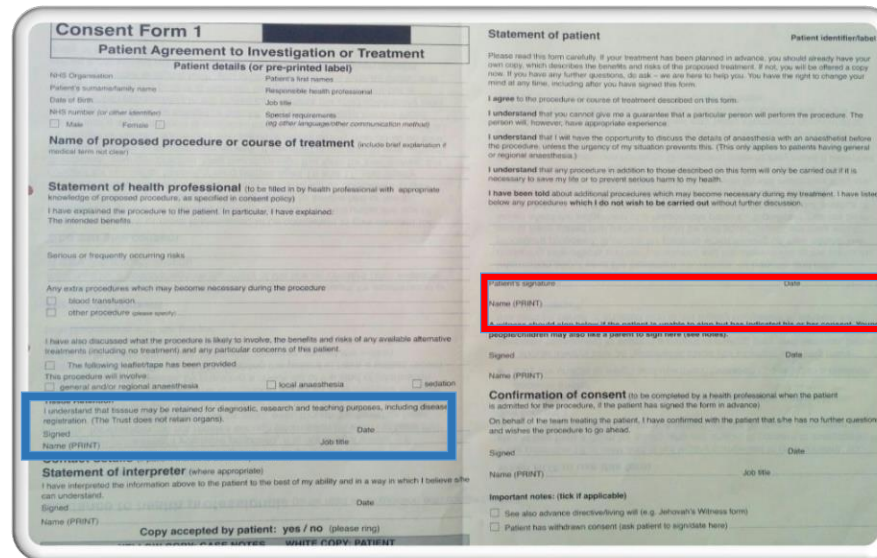
- ❑ As technology advances and high-quality imaging equipment becomes more widely available, interventional radiology is able to offer patients and referral physicians a host of new treatment options.

Establishing a patient safety programme in Interventional Radiology (IR)

PRE-PROCEDURE ELEMENTS

1. INFORMED CONSENT

- Informed consent is a patient's right to be presented with sufficient information, by either the physician or their representatives, to allow the patient or a guardian to make an informed decision regarding whether or not to consent to a treatment or procedure.



*Signed by
Consultant
Radiologist*



*Signed by
the Patient*

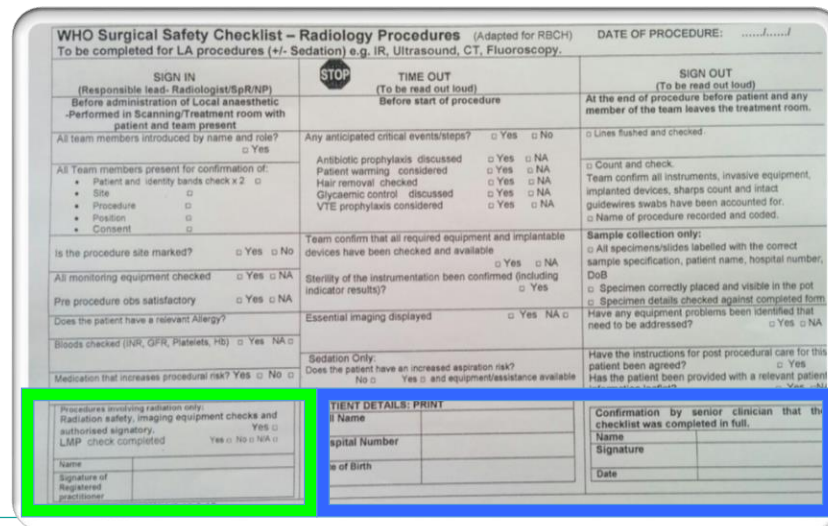


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2. WHO Surgical Safety Checklist – Radiology Procedures

- The checklist identifies three phases of an operation, each corresponding to a specific period in the normal flow of work:
 - Before the induction of anaesthesia (“sign in”)
 - Before the incision of the skin (“time out”)
 - Before the patient leaves the operating room (“sign out”).

In each phase, a checklist coordinator must confirm that the IR team has completed the listed tasks before the procedure proceeds.



The form is titled 'WHO Surgical Safety Checklist – Radiology Procedures (Adapted for RBCH)'. It is divided into three main sections: SIGN IN, TIME OUT, and SIGN OUT. Each section contains a list of tasks with checkboxes for completion. A 'STOP' icon is present in the TIME OUT section. At the bottom, there are sections for 'PATIENT DETAILS: PRINT' and 'Confirmation by senior clinician that the checklist was completed in full.' A green box highlights the 'SIGN IN' section, and a blue box highlights the 'SIGN OUT' section.

*Signed by
Radiographer*



*Signed by
Consultant
Radiologist*

The most important things that the patient needs to know before, during and after the procedure



- ❑ Fluoroscopy and CT helps the Radiologist to “see” inside the human body. The physician is able to examine a patient’s vascular, biliary or urinary system, anatomical structures and organs using Ultrasound, CT and Fluoroscopy. The Radiologist will make every effort to ensure that the patient is as comfortable as possible during the procedure.
- ❑ Once the patient arrives at the pre-procedure area the patient will most likely be asked to change into a patient gown and remove any jewelry. Clothes and shoes will be placed in a patient belongings bag which will be taken into the procedure room. The patient will be provided with all necessary items (e.g. a bag for their belongings).
- ❑ Most procedures in IR require three healthcare professionals: an Interventional Radiologist (MD), a Radiology Nurse and a Radiographer, but this depends upon the procedure.

The most important things that the patient needs to know before, during and after the procedure



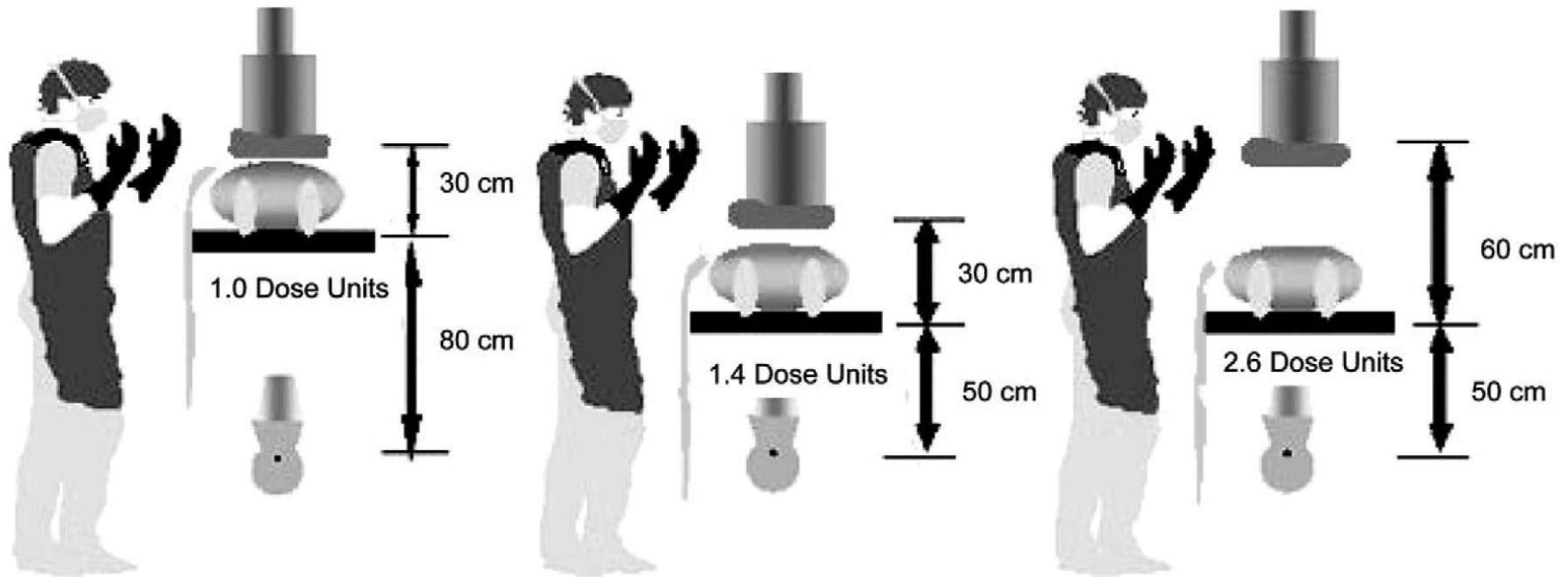
- ❑ During the procedure, the patient will be positioned on the x-ray table and the access site will be cleaned using an aseptic solution.
- ❑ Depending on the procedure type, the patient may be asked to hold their breath for brief periods of time.
 - ❑ Motion interferes with obtaining a good image.
 - ❑ Iodine-based contrast dye may be injected for visualisation of organs or structures depending on the type of procedure.
 - ❑ A x-ray based fluoroscopy system or CT will acquire images during the procedure.
 - ❑ After the procedure, all catheters will be removed, unless indicated otherwise by the physician.

The most important things that the patient needs to know before, during and after the procedure



- ❑ For some procedures, patients are required to recover for several hours with their leg or arm immobilised after the catheter is removed.
 - ❑ The recovery time is individual and will be noted in the patient's records by the Operator.
- ❑ In some rare cases, due to the high level of exposure, the patient might be asked to refer to their family physician for check-ups of the irradiated area in order to exclude very rare skin injuries.
- ❑ In paediatric imaging, special precautions are taken to reduce the exposure to the minimum necessary.

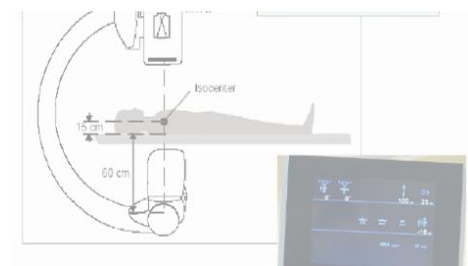
X-Ray Tube and Image Receptor to Patient Distance



Wagner LK. *Minimizing Risks from Fluoroscopic X Rays.*
The Woodlands, Tex: R.M. Partnership; 2000.

Establishing a patient safety programme in IR

- ❑ Know your equipment.
- ❑ Do not position the patient close to the x-ray tube.
- ❑ Minimise the patient-image detector distance.
- ❑ Shorten the fluoroscopy time (FT).
- ❑ Use the lowest frame rate consistent with the evaluated system and image quality.
- ❑ Be aware that oblique projections and lateral views will result in higher patient dose and some angulations result in higher operator exposure.
- ❑ Vary the position where the beam enters the patient when feasible.
- ❑ Keep a record of the patient dose (Kerma Area Product – KAP), Cumulative Air Kerma (CAK), and skin dose.
- ❑ Minimise the number of DSA runs and frames per run.
- ❑ Do not use acquisition mode for fluoroscopy (if applicable)
- ❑ When possible, archive fluoroscopy runs to avoid DSA runs.
- ❑ Use collimation to fit radiation to the area of interest. Virtual collimation helps to fit collimation without radiation.



Use diagnostic reference levels (DRL*) to optimise patient doses

- Are radiation doses delivered to my patients high or low?
 - To answer this question it is important to compile the radiation dose indicators of a set of procedures and compare its median value with the DRL.

If median dose > DRL

→ review your equipment and/or protocols

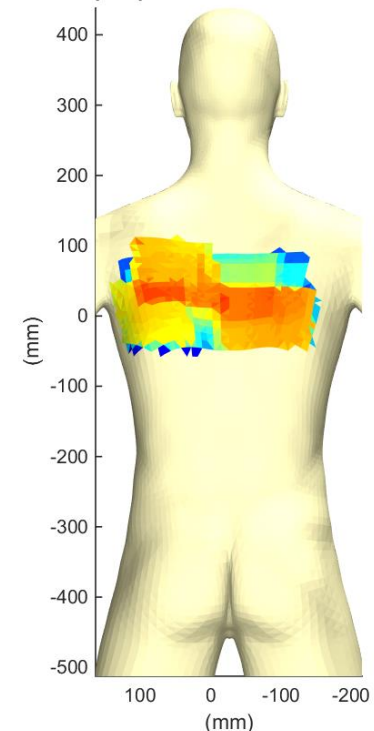
- Remember: DRLs depend on type of procedure and complexity. Do not apply DRLs to individual patients (a specific patient may need radiation doses over the DRL), but to a set of patients (n>10, average size and average complexity).

*ICRP, 2017. Diagnostic reference levels in medical imaging. ICRP Publication 135. Ann. ICRP 46(1).

Monitor patient x-ray doses during procedures

- Remember to monitor your patient doses during procedures
- Check the values of fluoroscopy time, DAP (*Product DoseArea*) and air kerma at patient entrance reference point (AK) (provided in real time in modern C-arms)
- If **DAP > 300 Gy·cm²*** or **AK > 3 Gy***, consider follow-up for possible skin lesions. Consult your Medical Physics Expert (MPE) to evaluate skin doses accurately.

Dosemap at patient's skin. PSD =5743 mGy



Example of calculation of dose map in the skin. Roberto Sánchez.

*Steker et al. Guidelines for patient radiation dose management. JVIR (2009);20: s263

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