

Ask EuroSafe Imaging Tips & Tricks

IR Working Group

Pregnant workers in interventional radiology

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- Women are grossly underrepresented in Interventional Radiology
 - This may be partly due to fear of radiation exposure, particularly in the child bearing age.
- There is a lot of misunderstanding and misconception regarding occupational exposure and potential radiation exposure of the conceptus.
- The following is aimed to clarify this important issue and put it in the right perspective.

Health effects of prenatal radiation exposure (ICRP 84, consensus CIRSE-SIR)

Health effects depend on the pregnancy stage and dose. Some effects have dose threshold, others haven't.

- At doses to the embryo or foetus lower than 100 mGy, the risk to deterministic effects (birth effects, growth retardation, pregnancy loss, mental retardation) is small or possibly inexistent.
- For leukaemia and childhood cancer there is no known threshold. For 10 mGy of foetal dose the relative risk may be as high as 1.4 and absolute risk is about 1/1700.
- At present, there is no evidence that exposures to the conceptus below 1 mSv during the whole pregnancy involve any additional risk to the unborn child.

- The BSS directive (Council Directive 2013/59/Euratom) states that:
 - As soon as the pregnant worker informs the employer about her pregnancy, the employer, shall ensure that the employment conditions for the pregnant worker are such that the equivalent dose to the unborn child is as low as reasonably achievable and unlikely to exceed **1 mSv** for at least the remainder of the pregnancy.
- National regulations in EU countries must respect this.



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Regulatory requirements

- European regulations DO NOT necessarily require that pregnant workers be excluded from participating in fluoroscopy guided interventions.
- Employers have to take administrative controls to assure that the dose to the embryo is under regulatory limits (1 mSv) and as low as reasonably achievable.



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Dose monitoring

- Conformity to the dose limit is most commonly demonstrated through the use of a single personal dosimeter worn under any protective apron by the pregnant worker at waist level from the date the pregnancy is declared until delivery.



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U.S. Air Force photo/Airman 1st Class Maeson L. Elleman
<https://www.af.mil/News/Photos/igphoto/2000274155/>

- The dose to the embryo and foetus can generally be approximated as one half of the personal equivalent dose at 10 mm, for the dosimeter under the protective apron at abdomen/waist.

Estimations of radiation dose in pregnant workers

- Qualified medical physics experts should assist in estimating radiation dose to the conceptus for pregnant or potentially pregnant workers.
- Previous dosimetry records will help in the estimation of the conceptus.
- In most cases, the conceptus dose is likely less than 125 μSv , and generally less than 5 μSv per case.

Estimations of radiation dose in pregnant workers

- **With proper use of radiation safety measures**, current data does not justify precluding pregnant physicians from performing fluoroscopy guided procedures.
- Very few female doctors are currently working in IR
 - about 12% of CIRSE full members in 2016.
- With proper radiation safety measures, exclusion of pregnant workers from fluoroscopic procedures solely on the basis of radiation risks to the conceptus cannot be justified on scientific grounds.



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Recommendations for pregnant and potentially pregnant women in IR



- A strategy to reduce radiation dose to the conceptus to the lowest possible level has to be applied even if it's lower than the limits.
- The ways to decrease dose do not differ if a potentially pregnant or pregnant interventional radiologists is performing the procedure and all general recommendations should apply.

General recommendations

- Wear your dosimeters and know your dose.
- Monitor your doses under the apron at abdomen/waist level.
- Use protective shielding lead aprons and standing/ceiling suspended portable shields.
- A minimum of 0,5 mm or more lead equivalent coverage should be provided.
- Use appropriate imaging equipment whose performance is controlled through a quality-assurance program.
- Use all available information to plan the interventional procedure and available dose-reduction techniques.
- Low doses to patients mean low doses to operators.

Summary

- Despite high levels of radiation in Interventional Radiology, it is possible to be protected at work.
- Using proper radiation protection measures it is possible for a pregnant interventional radiologists to keep conceptus doses under 1 mSv during pregnancy.
- It is the female interventional radiologist's choice, whether to continue to work in the angiography room during the pregnancy
 - Clearly, in accordance with national regulatory limits.
- There is no evidence that exposures to the conceptus below 1 mSv during the whole pregnancy involve an additional risk to the unborn child.
- A medical physics expert should monitor the X-ray dose to the conceptus to assure that it is under regulatory limits.

References

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