Ask EuroSafe Imaging

Tips & Tricks

Interventional Radiology Working Group

Interventional Series – Episode 2:
Pre-Procedure: Identify Risks and Optimize

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Essential Steps

1. Pre-procedure

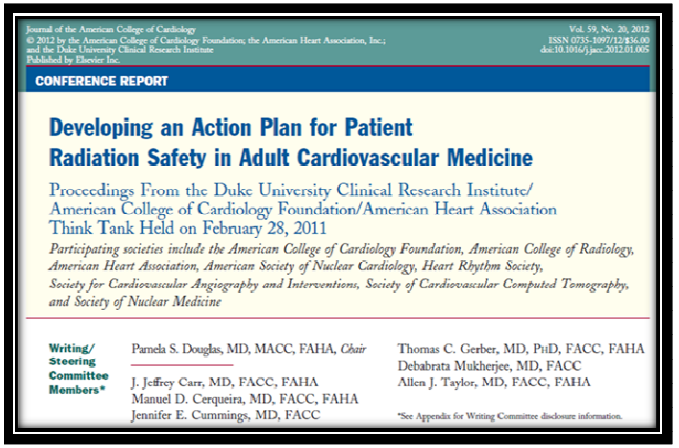
- **Identify patients at higher risks**
- **Evaluate equipment performances**
- **Train the personnel involved**

2. Intra-procedure

- Optimize the procedure to reduce dose
- Online dose monitoring
- Use of alert levels

3. Post-procedure

- Dose tracking
- Follow-up



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CONFERENCE REPORT

Developing an Action Plan for Patient Radiation Safety in Adult Cardiovascular Medicine

Proceedings From the Duke University Clinical Research Institute/ American College of Cardiology Foundation/American Heart Association Think Tank Held on February 28, 2011

Participating societies include the American College of Cardiology Foundation, American College of Radiology, American Heart Association, American Society of Nuclear Cardiology, Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Computed Tomography, and Society of Nuclear Medicine

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*See Appendix for Writing Committee disclosure information.

What can we do?

Establishing a radiation safety program for the catheterization laboratory should be a collaborative effort involving medical doctors, radiographers, medical physicists and hospital administration.

Identify high-risk patients

History of the patient, dosimetry and discussion of risk.

- Certain conditions are suspected to pre-dispose patients to radiation induced skin injuries (i.e. Diabetes mellitus, Connective tissue disorders, drugs, obesity…)

Also, a recent high dose procedure can result in the induction of effects at lower doses in the future (ICRP 85) → strategies to reduce dose:

- Privilege fluoro instead of acquisition runs
- Low dose protocols
- Use shutters, focus on the region of interest
- Use of different alert levels
- Postpone procedure?/prefer other practices?

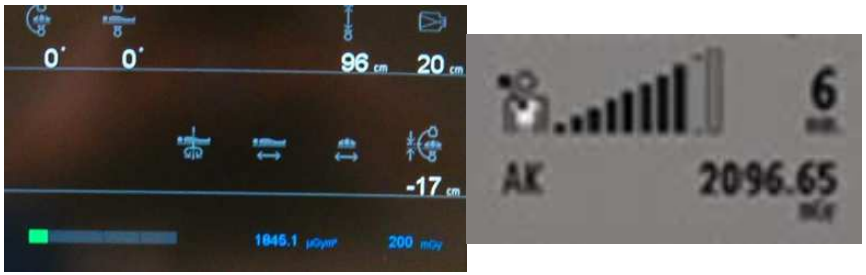
Equipment

Dedicated equipment:

- Spectral beam shaping
- Pulsed fluoroscopy (often at reduced frame rates)
- *Store Fluoro* function

Compliance with standards (IEC 60601 - 2 – 43 interventional fluoro safety standard):

- Display of dosimetric indicators
- Low dose fluoroscopy mode



Evaluate the performance over time.

Evaluate the impact of new technologies

- i.e.: replacing an old equipment with a “new generation” one; or the introduction of a new technology like CBCT, etc.

Risk of Unfavourable Settings

Radiation Protection Dosimetry (2005), Vol. 117, No. 1–3, pp. 97–101
doi:10.1093/rpd/nci747 Advance Access published on February 3, 2006

ARE NEW TECHNOLOGIES ALWAYS REDUCING PATIENT DOSES IN CARDIAC PROCEDURES?

A. Trianni[1,2,*], G. Bernardi[3] and R. Padovani[1]

Table 1. Results for CA procedures in terms of mean total dose–area product (DAP), fluoroscopy time and relative contribution of fluoroscopy and acquisition mode to total DAP.

CA	Mean fluoroscopy time (min)	Mean DAP (Gy cm^2)	DAP Fluoro (%)	DAP Cine (%)
II system	4.3 ± 4.5	31.1 ± 30.2	32	68
FPD system	4.3 ± 3.8	33.4 ± 19.1	41	59

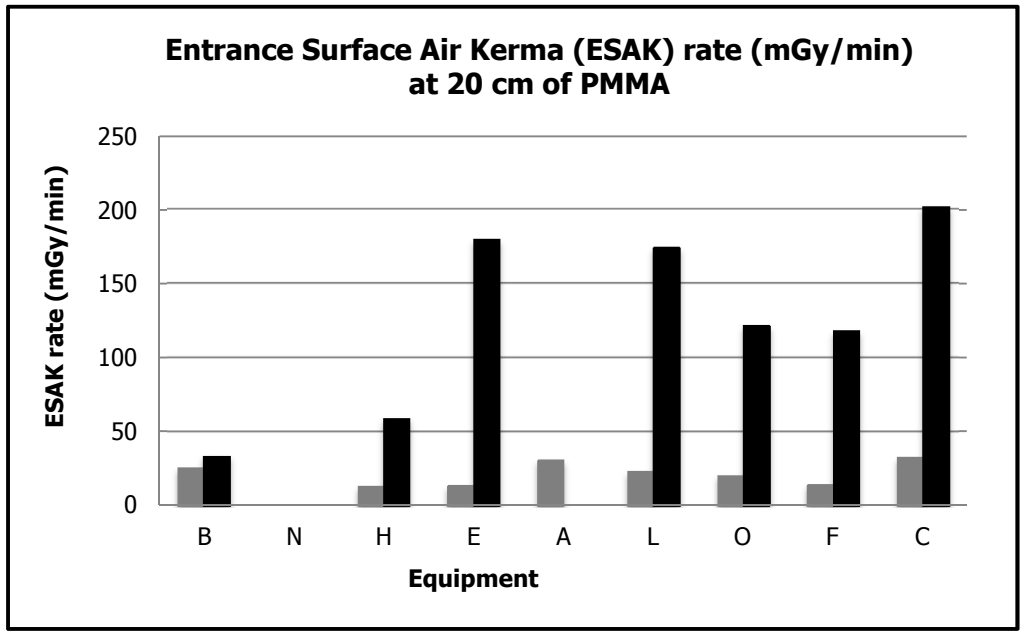
Table 2. Results for PTCA procedures in terms of mean total DAP, fluoroscopy time and relative contribution of fluoroscopy and acquisition mode to total DAP.

PTCA	Mean fluoroscopy time (min)	Mean DAP (Gy cm^2)	DAP Fluoro (%)	DAP Cine (%)
II system	11.4 ± 9.3	52.0 ± 45.0	56	44
FPD system	10.7 ± 8.7	66.9 ± 54.4	52	48

When compared, angiographies based on DFP detectors have higher sensitivity than systems based on II. The DFP system, in fact, produces images at comparable or higher quality with lower entrance dose rates, compared to the II system. However, if the two systems use different settings in the clinical practice, the final performances in terms of patient dose could give the opposite result. DAP and MSD

Equipment

<u>CRITICAL POINT</u> → protocol configuration



Dosimetric settings of the equipment used for the same types of procedure (i.e. cardiac) in different centres might show important variations.

"Problems connected with exposure to ionizing radiation of workers and patients in Interventional Radiology"
(Age.Na.S./ISS/AOU S. Maria della Misericordia di Udine)

Protocols Optimization

- Image Quality depends on the type of procedures (cardiac, vascular, neuro,..) and can change during the procedure itself due to change in thickness and objects imaged in the different projections
- Image Quality (i.e.: contrast, spatial resolution, noise) is strictly related to dose

- Need to adapt Image Quality level to different procedures and steps of procedure

ESSENTIAL COLLABORATION

PHYSICIAN/PHYSICIST/RADIOGRAPHER/FIELD ENGINEER

- Appropriate maintenance and QC are fundamental (acceptance test + constancy tests 1-2 times/year; acceptance and commissioning tests have to be repeated at any important change, including software update)

Education and Training

Personnel (physicians, radiographers, nurses) performing fluoroscopically-guided procedures should be trained in the safe use of fluoroscopic equipment

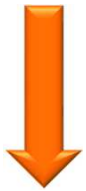
- To understand dose saving features of each type of equipment on which they work
- To understand the tools available to reduce patient dose
- To understand the meaning of dose indicators available

→ Regular Courses:

- Basic radiation protection: 4-5 courses/year
- Advanced: every 5 years

Training of physicians and staff

Interventional Service: implementation of policies and procedures to minimize the number and severity of radiation-induced injury compared



Periodic inter and intra departmental

Proactive Approach → to monitor the performance and look for opportunities for improvement.

FMEA (*Failure Mode and Effect Analysis*): different steps to reduce the frequency of adverse events and minimize the severity. You can see by the time the error that can occur, and then try to adopt methods and procedures to modify the task execution to prevent a worsening of adverse events.

Next Steps…

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