Radiation Protection: From Global to Local

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Disclosure

Speaker name:
Alexander..Gangl..............................................................

I have the following potential conflicts of interest to report:

☐ Consulting

☐ Employment in industry

☐ Stockholder of a healthcare company

☐ Owner of a healthcare company

☐ Other(s)

☒ I do not have any potential conflict of interest
Global Organizations interested in radiological protection:

- CRCPD
- EAN
- EC
- FDA
- ICRP
- ENISS
- NERIS
- EURADOS
- ALLIANCE
- HERCA
- FORO
- ICRQS
- ESR
- FDI
- IOMP
- INWUN
- ISOE
- IAEA
- ICRU
- ILO
- IRPA
- MELODI
- NCRP
- NEA
- UNSCEAR
- WHO
- WNA
- ICR
- ISSRT
- HERCA
- IHA
- and more...
Efforts to coordinate worldwide improvement of radiation protection in medicine:

„BONN CALL FOR ACTION“ 2012: IAEA and WHO organized international conference in Bonn, Germany

… outlines ten major strategies for promoting radiation protection:

1. Enhance the implementation of the principle of justification
2. Enhance the implementation of the principle of optimization of protection and safety
3. Strengthen manufacturers’ role in contributing to the overall safety regime
4. Strengthen radiation protection education and training of health professionals
5. Shape and promote a strategic research agenda for radiation protection in medicine
6. Increase availability of improved global information on medical exposures and occupational exposures in medicine
7. Improve prevention of medical radiation incidents and accidents
8. Strengthen radiation safety culture in health care
9. Foster an improved radiation benefit-risk-dialogue
10. Strengthen the implementation of safety requirements globally
Efforts to coordinate worldwide improvement of radiation protection in medicine:

Worldwide national strategies, action plans and platforms have been formed to impact the current diagnostic imaging practice, support self regulation, increase awareness of radiation safety of patients, workers, and the general public, and promote a radiation safety culture to all stakeholders:

- Eurosafe Imaging
- Afrosafe
- Image wiseley (Adult imaging)
- Canada safe imaging
- Arabsafe
- Latinsafe
- Image gently (Pediatric imaging)
- RPOP-IAEA
Main problems regarding radiation exposure in the course of interventional procedures:

- highest doses to staff and patients
- Patients: doses that may reach those of radiotherapy fractions
- Staff: some of the highest occupational exposures
Some objectives regarding radiation protection in the Cathlab

- Discussing radiation risks in the case of potential high dose procedures (especially young patients)
- Staff has to become more aware of radiation risks to themself and patients
- Making population more sensitive to this topic (written consent)
- Support development of technical solutions for reduction of radiation exposure (Patients, Staff)
- Encourage research in long term effects of low dose radiation (may increase interest of medical staff in radiation protection)
Potential obstacles in radiation protection

• Increasing number of clinical professionals are involved in interventional procedures (radiologists, angiologists, cardiologists, electrophysiologists, vascular surgeons, orthopaedic surgeons, urologists, gastroenterologists, anaesthetists) ... BUT ARE THEY ALL TRAINED TO AN ADEQUATE EXTENT??

• An international workshop organized by the IAEA and the European Commission concluded that: “There is a significant and systemic practice of inappropriate examination in radiology.” (e.g. double examinations)

• Requirements for handling modern angiography systems are complex and demanding (staff needs to be trained regularly)

• Different fluoroscopic dose quantities and varying units may contribute to uncertainties (air kerma-area product (PKA), entrance surface air kerma (Ka,e), incident air kerma (Ka,i); mGycm², Gym², cGycm², dGycm², Gycm², mGym²)
Methods to improve radiation protection in medicine

• Focus on radiation protection education and training for health professionals globally, targeting all professionals using radiation in all medical areas.
• Procedure-specific DRLs for various patient groups (to compare your typical dose levels)
• Improving the effectiveness of communicating about radiation risk (to patients, the public, physicians, surgeons, allied professionals, and of course the radiologists)
• Improving justification, appropriateness and referral patterns.
• Ensure improved safety of medical devices by enhancing the radiation protection features in the design of both physical equipment and software and to make these available as default features rather than optional extra features;
The use of medical imaging, including that using ionizing radiation is certainly increasing. This is due to a variety of factors, some of which are clearly recognized as a benefit for quality of care in the patient. However, there are multiple factors which drive imaging utilization and can contribute to what some consider substantial overutilization.
Dose reducing techniques

by changing several technical parameters:

- **Pulse rate** (4, 7.5, 15, 30 p/s)
- **Frame rate** (0.5, 1, ..., 6, 10 f/s)
- Less documentation
- Remove scatter grid  ~ 50 % dose reduction
  (pediatric imaging, small object volume)

...or by using some useful programs:

- Low-dose programs
- **Automap-function, 3D Fusion** (CTA, MRA-Overlay)
- Stored C-arm positions, Last Image Hold (LIH)
Dose reducing techniques

Dose rate depending on the pulse rate (P/s)

<table>
<thead>
<tr>
<th>Pulse rate (P/s)</th>
<th>Dose rate in %</th>
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<tbody>
<tr>
<td>30</td>
<td></td>
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<tr>
<td>15</td>
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<td>7.5</td>
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Dose reducing techniques

Dosereduction (low-dose program)

Size of Field of View

Patient Entrance Dose (mGy)

- **FOV (48 cm)**
  - standard program
  - low-dose program

- **FOV (32 cm)**
  - standard program
  - low-dose program

- **FOV (11 cm)**
  - standard program
  - low-dose program
## Dose reducing techniques

### Staff Exposure - Scattered Radiation

<table>
<thead>
<tr>
<th>Angulation of the C-arm[°]</th>
<th>FOV[cm]</th>
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<tbody>
<tr>
<td>-15</td>
<td>48</td>
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<td>-30</td>
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<td>-60</td>
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<td>32</td>
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**Doses [µSv]:**
- **Dose/Assistant [µSv]:**
- **Dose/Physician [µSv]:**

- **RAO**
- **LAO**

The chart shows the dose in different conditions with increasing angles and fields of view.
In general it can be stated that...

The **LAW** is good   
but **CULTURE** is  
better !!!

Thanks for your attention…
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