Facing the challenges: IAEA activities to protect the patients

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Objective

Provide the participant with information on the medical uses of radiation and related radiation risks and the IAEA activities on radiation protection of patients
The first dental radiograph taken 14 days after the announcement of the discovery of Roentgen rays by Friedrich Otto Walkhoff. He took an ordinary photographic glass plate, wrapped it in a rubber dam, held it in his mouth between his teeth and tongue and then lay on the floor for a 25 min exposure.

He noticed a loss of hair on the side of the head of some of the patients he irradiated.
More can be done with radiation in medicine

- More equipment
- More complex equipment
- New technologies and techniques
- New role

Single slice CT ⇔ Multi-Detector CT
Film ⇔ Computed & Digital Radiography
Hybrid imaging, PET-CT
Image-guided interventional procedures
Tomosynthesis, Cone beam CT
PACS, RIS, IMRT, IGRT etc...

Access vary around the world
Issues vary around the world
Global trends

Growth of high-dose radiation procedures:
CT, interventional, SPECT-CT, PET-CT

Brenner, Hall.  

In USA:
1980: 3 mill. CT procedures
2005: 63 mill

1/3 of them unjustified
Global trends

Increased individual patient doses from diagnostic exams

Over the 22 years study period, 32000 patients
- > 33% of patients underwent more than 5 lifetime CT scans
- 5% underwent 22-132 CT scans
- 15% received doses over 100 mSv;
- 5% received doses over 250 mSv
Increased cancerogenic risk at these doses

1.5 – 2% of fatal cancer cases in USA may be attributable to the radiation from CT studies

Sodickson et al. Radiology 251; 175-184, 2009
“Do more good than harm”

“Primum non nocere”

ICRP principles of radiation protection

- Dose limits don’t apply to medical exposures
- **Justification** - perform only appropriate procedures
- **Optimization** - perform procedure appropriately
Perform only appropriate procedures

**Level 1**
**General justification**

of the use of radiation in medicine

Taken for granted – accepted that the use of radiation in medicine does more good than harm

**Level 2**
**Generic justification**

of given radiological procedure

Carried out by the health authority in conjunction with appropriate professional bodies

**Level 3**
**Individual justification**

of medical exposure of individual patient

Carried out by consultation between the radiological medical practitioner and the referring medical practitioner
Optimization
Perform procedure appropriately

Equipment
- Design
- Settings
- Maintenance
- Calibration
- Quality assurance

Operation
- Standard protocols
- Proper operation
- Patient dosimetry
- Training
Medical radiation is a wonderful tool, when used with

- KNOWLEDGE
- AWARENESS
- RESPONSIBILITY
IAEA activities to support implementation

- Providing standards
- Providing training
- Providing guidance
- Facilitating knowledge exchange
- Giving technical assistance
- Building awareness

- Safety standards
- Safety reports
- Technical documents
- Public website
- Meetings
- Workshops
- Reporting systems
- Scientific publications
- Press campaigns
- Information campaigns
- Missions

- Training courses
- Training material
- Fellowships
- Scientific visits
- Involve in projects
- Providing tools
- Direct advice
- Assessments

AAA International campaign
- Awareness
- Appropriateness
- Audit
IAEA Safety Standards

Safety Fundamentals

Safety Requirements

Safety Guides

Fundamental safety objectives and principles for protecting people and environment

Requirements that must be met to ensure protection of people and environment

Legal obligations, "shall"

Recommended ways of meeting the requirements, "should"
Providing guidance

- Development process:
  - 2012 – 2014: first draft prepared by 3 drafting group (DR&IR; NM; RT)
  - 2014 – 2015: soliciting and addressing comments by MS, and organizations internal approvals, comments from MS, next draft, approval by a number of committees....
  - 2015 – 2018: target publication
Providing guidance

- Radiation Protection in Dental Radiology (new)
  - DPP approved (Safety Report Series)
  - Advanced draft prepared in cooperation with WHO, World Dental Federation, International Association of Dento-Maxillofacial Radiology, International Organization for Medical Physics, Image Gently

- Recording, Tracking, and Managing Patient Exposure Data in Medical Imaging (new)
  - DPP approved
  - First draft prepared in cooperation with ICRP, WHO, UNSCEAR, Working Group 28 (Physics strategy) of DICOM
  - CS planned 29 May-2 June to finalise
Providing guidance

Pregnant?
or think you could be?

Please tell the staff before an X ray or nuclear medicine procedure

What you need to know

Unborn babies are more sensitive to radiation.

Risk depends on stage of pregnancy, type of procedure and the amount of radiation used.

Diagnostic radiological procedures are safe under most circumstances even during pregnancy.

DO’s and DON’Ts

Don’t avoid the procedure if it’s important for your health.

Do ask the medical staff what measures will be taken to reduce any risks.

Do seek advice before the procedure if you are concerned.

Do ask if a pregnancy test is needed.

Available in 19 languages
Providing guidance
Providing guidance

10 Pearls: Radiation protection for children in interventional procedures

1. Remember: Some tissues of a growing child are more sensitive to radiation than adults.
   Children have longer life span to manifest radiation effects.

2. Discuss with parents before the procedure:
   - Ask about previous exposures.
   - Answer their concerns about radiation safety.

3. Increase awareness among your team members through the use of a pre-procedure safety checklist.

4. Plan the procedures in detail and in advance to avoid improper or aborted runs or other repeated exposures.

5. Protect the patient's thyroid, breast, eyes and gonads where possible.

6. Use optimal technique:
   - Lower frame rates. Decrease from 7.5 to 3 pulses per second when possible.
   - Remove grids from machine if possible for infants under 20 kg.
   - Use air-gap technique instead.
   - Minimize imaging time.
   - Minimize field overlap in repeated acquisitions.
   - Use tighter collimation.
   - Minimize magnification usage.

7. Use “last image hold” rather than additional exposures, where appropriate.

8. Increase distance between patient and the X-ray tube and decrease distance between patient and image receptor.

9. Use dose recording and dose reduction technologies in equipment.

10. Review and record radiation dose after the procedure.


Facilitating knowledge exchange

Technical meetings

IAEA Technical Meeting on Preventing Unintended and Accidental Medical Exposures in Radiology
The Meeting held at the International Atomic Energy Agency (IAEA)’s Headquarters in Vienna, Austria, from 6 to 8 March 2017
Facilitating knowledge exchange

- Incident reporting databases
  - Anonymous
  - Voluntary
  - Learning from incidents

- SAFRAD
  - Interventional procedures

- SAFRON
  - Radiation therapy
Facilitating knowledge exchange

Information databases for medical staff

- ISEMIR-IC
  
  Working Group on Interventional Cardiology
  
  Gathering an overview picture of the situation concerning occupational exposures and radiation protection of staff in interventional cardiology all over the world
Providing training

- Development of standard packages for training in the application of the safety standards
  - Approved training packages on:
    - Radiation protection in:
      - Diagnostic and interventional radiology
      - Nuclear medicine
      - Radiotherapy
      - Cardiology
      - PET/CT
      - Paediatric radiology
      - Digital radiology
      - Doctors using fluoroscopy outside radiology
    - Prevention of accidental exposure in radiotherapy
  - Dissemination of training material
    - Downloadable for RPoP website or available as CD
Web-based learning

IAEA launches new E-learning

Radiation Dose Management in Computed Tomography

The IAEA has created an e-learning program designed to provide continuing education to medical imaging professionals in safety and quality in computed tomography (CT).

“Radiation dose management in CT” provides continuing education to health professionals on the safe and effective use of computed tomography (CT). This e-learning course explores the technical applications of patient radiation protection in CT imaging and is available to participants all around the world.

Specific topics covered in this course include justification and optimization of radiation dose, overviews of referral guidelines, explanations of the technical parameters of CT scanning, dose metrics, and specific CT protocols for body regions and for patients particularly vulnerable to radiation risk.

The course is organized into eleven modules, each with a short series of questions at the end. These questions are provided as a self-check for participants to review their own understanding of the material.

Throughout this e-learning course the participants are expected to:

- Learn the appropriate use of CT and be able to apply this understanding in a clinical setting;
- Understand the dose reduction potential of various CT scan parameters, automatic exposure control, reconstruction algorithms and other CT techniques;
- Understand different dose metrics for CT and learn how radiation dose tracking methods can be used;
- Address the unique needs of various CT protocols, including those for chest, abdomen, and head, as well as those for pregnant or pediatric patients.
- The estimated time for the entire course is 5 hours maximum. After completing the course, participants can take the final exam to receive a certificate of attendance. This e-learning course is provided in English.

If you wish to receive a certificate:
Providing training

• Providing training courses
  • Regional training courses
  • National training courses supported
  • Main target audience: health professionals in hospitals; but also radiation protection professionals
Technical cooperation

• Regional and national projects:
  – High number of countries participating in technical cooperation projects on radiation protection of patients
  – Seven main tasks in projects, in all major areas of patient protection
  – Expert missions, direct advice and provision of tools
  – Fellowships & Scientific Visits
  – Regional & national training courses
International Action Plan for Radiation Protection of Patients

- The Bonn Call-for-Action, joint position statement with WHO, highlights ten main actions, and related sub-actions, that were identified as being essential for the strengthening of radiation protection in medicine over the next decade.

- Member States have requested (GC 2013) that the IAEA takes the Bonn Call-for-Action into consideration in the International Action Plan for Radiation Protection of Patients.
2017 International Conference of Radiation Protection in Medicine

- International Experts in Radiation Protection of Patients
- Poster and lectures
- Over 300 abstracts accepted
- Over 15 different thematic areas
- Registration is free and open to all
Conclusion

• Never refuse a **needed** examination. Despite the risks associated with exposure, the benefits of medically justified exam outweigh the risks.
• Do not insist on an X-ray if the doctor says it's **not** necessary.
• **Communicate** with medical team if you might be pregnant.
• There is **no** internationally prescribed "upper limit" for a radiation dose from medical procedures, or for number of examinations.

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Thank you
Thank you!