ICRP Justification framework document

Committee 3

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Initially

- The work started with two groups:
  - Justification of Imaging of Asymptomatic Individuals with Ionizing Radiation
  - …and….
  - Justification in Diagnostic Medical Uses of Ionizing Radiation

- ….which were merged in one!
WP: Justification in Medical Use of Ionizing Radiation

- **Chair**: Katrine Riklund
- **Full members from C3 ICRP**: Donald Miller, Kimberley Applegate, Pek-Lan Khong, Reinhard Loose,
- **Corresponding members**: Georgi Simeonov, Hans Ringertz, Jim Malone, Jonas S Andersson, Juergen Griebel, Maria Perez (WHO), Ola Holmberg (IAEA), Steve Ebdon Jackson.
Focusing

- Several on-going activities in the field
  - Image Gently, Image Wisely, Choose Wisely, ESR Eurosaf

- ICRP C3 decided that the justification paper:
  - Should have content not published elsewhere
  - Should not be a repetition of already published issues regarding justification.
  - Will not include a broader scope with for instance radiation therapy
Terms of reference

- Framework for justification of the use of ionizing radiation in *diagnostic radiology*
- The focus is on the process of and framework for *justification*
- Useful for justification of imaging of
  - *Patients*
  - *Asymptomatic individuals*
- The audience of the document is referring physician, authorized imaging health care practitioners, medical physicists and imaging specialists; radiologists, nuclear medicine physicians as well as radiation safety authority representatives.
Advanced Imaging

- The modern technologies such as SPECT, CT, MR and hybrid imaging with SPECT or PET/CT and PET/MR give new opportunities to
  - find diseases at earlier stages (preclinical?)
  - early treatment evaluation
Justification

- Level 1:
  - Justification of Use of Radiation in Medicine

- Level 2:
  - Justification of a Defined Radiological Procedure

- Level 3:
  - Justification of a Procedure for an Individual Patient
Patients and Asymptomatic Individuals

Diagnostic Imaging
- Symptoms or not
- Known/unknown disease
- Treatment decision
- Optimized for organ
- Justified

Imaging of asymptomatic
- Asymptomatic
- ”Unknown”/no disease
- Role out disease
- Optimized for Whole body
- Justification?
Ionising Radiation from Imaging

- CT and PET/CT responsible for the increase
- Not only increase in the number of equipments
- Increased speed – thousands of images in seconds
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Radiation Dose in Imaging

- Evidence for risk at very low doses is missing. Eventually effects may present late (minimum 10 years) and the link between adverse events and radiation exposure is missing.
- Development toward lower doses for CT
  - Need optimized protocol
  - Need modern technique
Dose in Cardiac CT

- 8-15 mSv
- 2-4 mSv
- 0.07-2 mSv

✓ Education
✓ Proper CT
Today:
Collimation 383 (2x192) x 0.6 mm
Spatial resolution: 0.24 mm
Scan time: 0.25 s
Tube setting: 70 kV, 583 mAs
Iv contrast: 25 ml
Body weight: 80 kG
Eff. dose: 0.3 mSv
Clinical Support

- Referral guidelines, appropriateness criteria and clinical decision support systems are used for justification at level 2, and they need to be regional or locally adapted.
- Medical treatment guidelines may mandate specific examinations.
The primary concern for justification is to decide if the examination can answer the clinical question:

- Diagnose or rule out a disease
- Staging of disease
- Treatment evaluation
- Follow up
- Screening for a certain disease
- ...
Who should do the job?

- Justification is a shared responsibility between the referring physician and the radiologist.
- The balance of the responsibility is variable and depends on the patients age, dose bands, examination type, radiation risk and national, regional or local regulations.
Justification

- The process of justification is evaluated for each patient or individual (level 3)
- The consent of the individual is required for each and every procedure
In the worst case...

- The chosen method cannot answer the clinical question (patient)
- The chosen method cannot rule out the disease (asymptomatic individual)
- ...but findings might
  - need follow up
  - be over treated
  - causing complications
- Distribution of scarce resources
Information Needed

- Justification is done for each examination (level 3) taken into account:
  - prior procedures history but not previous radiation exposure except for the deterministic tissue reactions.
  - never forget the medical indication
  - information already collected?
  - individualisation needed!
- If possible, procedures without ionising radiation should be chosen, especially in young patients.
  - MRI or ultrasound
If 5% prevalence of disease
95% sens and 85% spec of the test
+LR 9.5
-LR 0.06
95 false positive!
3 false negative!

<table>
<thead>
<tr>
<th>Test-result</th>
<th>Disease</th>
<th>Healthy</th>
<th>Number</th>
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<tr>
<td>+</td>
<td>47.5</td>
<td>95.0</td>
<td>143</td>
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<tr>
<td>-</td>
<td>2.5</td>
<td>855.0</td>
<td>858</td>
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<tr>
<td></td>
<td>50</td>
<td>950</td>
<td>1000</td>
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</tbody>
</table>

|            | TP      | 4.8%    |
|            | TN      | 80.8%   |
|            | FP      | 14.3%   |
|            | FN      | 0.3%    |
Special Considerations

- Children
- Pregnant
- Defensive medicine
- Non-medical examinations
- ...
Summary

- Medical question to be answered
- Very low dose and risk?
- Justification is shared work
- Take prior procedures into account
- Referral guidelines, appropriateness criteria and clinical decision support systems
- Medical treatment guidelines
- Asymptomatic individuals
  - Screening program (level 2)
  - Justification (level 3)
Thank you for listening

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