Inspection with Cardiology departments in Norway

- Are they making it great in radiation protection?

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www.nrpa.no
Interventional cardiology
8 hospitals
45,000 coronary procedures
70 cardiologists
Why inspections in Cardiology?

- High-dose and increase in the number of procedures
- Skin burns of patients have been reported
- Cardiologists in Norway have no formal education and training in radiation protection
Development of mean doses over apron (D > 0 mSv) for medical staff in the period 2001-2010 (NRPA Report 2011:11)
Inspection method

1. Notification of inspection
2. Opening Meeting
   - Interviews
   - Observations
3. Documentation
   - Summarizing
4. Verifications
   - Acceptance of non-conformities
5. Closing meeting
6. Inspection report
   - Report website
Topics

- Justification
- Optimisation
- Protection of staff and patients
- Personal dosimetry
- Organisation of the radiation protection (RP)
- Education and training in RP
- Quality control
Local standard dose
- Coronary angiography:
  • 20 patients
  • 55–90 kg
  • DAP (Gycm^2)

Coronary angiography
Tidsskrift for Den norske legeforening, 2006
Significant variation in local standard dose DAP: 7 Gycm² - 47 Gycm² s
Observations

Work technique
Shielding
Exposure parameters
Use power injectors for contrast

“In conclusion, this study has shown a dose reduction of approximately 50% to the operator using a power injector to deliver contrast media”
Most common results

**Non-conformities** – a finding that are in conflict with existing legislation

**Remarks** – a finding which is not in conflict with legislation, but a comment that may improve the quality, safety or practice

- **High staff doses**: 4 non-conformities, 2 remarks
- **Optimization & DRL**: 4 non-conformities, 6 remarks
- **Incident reporting**: 4 non-conformities, 6 remarks
- **Follow-up high patient doses**: 2 non-conformities, 4 remarks
- **Education & training**: 10 non-conformities

Total: 17 non-conformities & 23 remarks
Optimisation at one hospital
- Coronary angiography

After inspection, reduced standard dose with 48 %
- Training
- Pulse mode 15 p/s – 7.5 p/s
- Reduced mA
- Work technique

![Graph showing standard dose DAP (Gycm²) from January-February 2014 to March-April 2014.]

- January - February 2014: 40 Gy·cm²
- March - April 2014: 21 Gy·cm²
Dose reduction technologies

- Pulsed fluoroscopy
- Collimation

Mahesh M. Radiographics 2001;21:1033-1045
Effect of geometric magnification on entrance skin dose

Keep the X-ray tube as far as possible from the patient and the image receptor as close as possible to the patient.

Position 1:
SEE = 1.0 dose units
Magnification = 1.25

Position 2:
SEE = 1.8 dose units
Magnification = 1.67

Position 3:
SEE = 4.0 dose units
Magnification = 2.50

Mahesh M. Radiographics 2001;21:1033-1045
Decreased number of high patient doses

<table>
<thead>
<tr>
<th></th>
<th>January-February</th>
<th>March-April</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procedures with DAP above 250 Gycm²</td>
<td>37</td>
<td>1</td>
</tr>
<tr>
<td>Total procedures</td>
<td>394</td>
<td>347</td>
</tr>
</tbody>
</table>
Decreased personal doses
Hp[10]

Total reduction personal doses 68%
# Evaluation of the inspections (EasyResearch)

Average score on a scale from 1 to 5, where 5 is the best

<table>
<thead>
<tr>
<th>Question</th>
<th>Mean score (1-5)</th>
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<tbody>
<tr>
<td>Do you agree with the non-conformities and remarks given at the closing meeting?</td>
<td>😄😊😊😊😊 3.9</td>
</tr>
<tr>
<td>What is your total impression of the inspection?</td>
<td>😄😊😊😊😊😊 4.4</td>
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Did the inspection bring any changes in the departments afterwards?

- No: 8%
- Yes: 92%
Conclusion

- Are they making it great in radiation protection?

- Significant variation in local standard dose
- Substantial lack and variation in level of RP at the cardiology departments
- Inspections are an effective tool to increase the awareness of RP and improve RP and safety