Procedure trends

Increase in
- number of procedures
- complexity

Increase in
- procedure time and
- exposure dose
Measures reducing dose

Endovascular: same IQ at 83% less X-ray

Same procedure by different surgeons – different radiation doses

Average radiation dose for EVAR

<table>
<thead>
<tr>
<th>Surgeon 1</th>
<th>Surgeon 2</th>
<th>Surgeon 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.96 mS</td>
<td>2.50 mS</td>
<td>5.60 mS</td>
</tr>
</tbody>
</table>

Significant difference in radiation dose among surgeons


Awareness ≠ (Re)action

No perception of danger → no awareness → ... no action for protection

“Tired I felt this radiation could not hurt me. I felt indestructible”

How we assess radiation in a real life?

Fluoro time

Fluoro time is visible and easily understandable
**Dose for different procedures (USZ)**

![Graph showing Total Dose Area Product (DAP) per Procedure]

- Highest dose is near to the tube

**Dose EVAR - staff members (USZ)**

![Cumulative radiation dose]

Highest dose is near to the tube

**Radiation “visibility” to minimize risk**

“See” your scatter dose mapping during procedure to minimise risk exposure for surgeons

**Working tools – Dose Aware**

**DoseAware**

Make the invisible visible

Empowers you to manage your personal x-ray dose exposure

- Real-time visualizing of personal x-ray dose at a glance
- Immediate see the effect of change and relation to dose

**Philips DoseAware system**

Dosimeter should be weared outside of the lead rubber

→ it avoids bias of
  - operator location
  - utilisation of protective devices

→ it allows to evaluate
  - the efficacy of selfprotective measures

Note: DoseAware is not a legal dosimeter for occupational dose. Film/TLD badges are still legally required by radiation protection authority.
Philips DoseAware system

Each team-member wears his own dosimeter

Dose-rate during 1 EVAR procedure

DoseAware software generates an EXCEL Table with exposure data for easy statistical assessment

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Real time radiation measurement does not reduce radiation dose in short term FU

Radiation dose of radiologists during 1 week blind vs. 1 week regular application of the real time radiation measurement system

Staff dose measurement in real time, an evaluation of Univ Raysafe I
Mehdi Khosravinia
Department of Radiation Physics
University of Umeå, Umeå, Sweden January, 2013

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Real time radiation measurement reduces radiation dose in mid term FU

<table>
<thead>
<tr>
<th></th>
<th>Operators</th>
<th>Assistant nurses</th>
<th>Interns</th>
<th>Patient responsible</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collective PDD</td>
<td>2601</td>
<td>466</td>
<td>129</td>
<td>83</td>
<td>3231</td>
</tr>
<tr>
<td>Collective PDD</td>
<td>1782</td>
<td>256</td>
<td>112</td>
<td>89</td>
<td>2133</td>
</tr>
</tbody>
</table>

- * p < 0.05

Application of the DoseAware
- Period I – blind (2 months)
- Period II – regular (2 months)

Tu Mai, The use of a Real-Time Displayed Measuring System for X-rays an evaluation of personnel doses in an angiography room with a DoseAware System
Jan. 2011, Gothenburg, Sweden

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Conclusion

- Real time radiation measurement reduces radiation dose in mid term FU
- Regular usage of DoseAware can potentially reduce radiation exposure of the surgical team members
- Long term FU study is necessary to prove the effectiveness of DoseAware system
Other methods

Figure 3. Set-up in the hybrid room and in the operating room with the mobile C-arm.

Impact of Hybrid Rooms with Image Fusion on Radiation Exposure during Endovascular Aortic Repair

A. Ramdani, S. Duran, J. Spadaccini, A. Martin-Grande, E. de Boer, G. Kaptein, M. Pilewski, W. Rohde

Thank You!

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