

# Inspection with Cardiology departments in Norway

- Are they making it great in radiation protection?

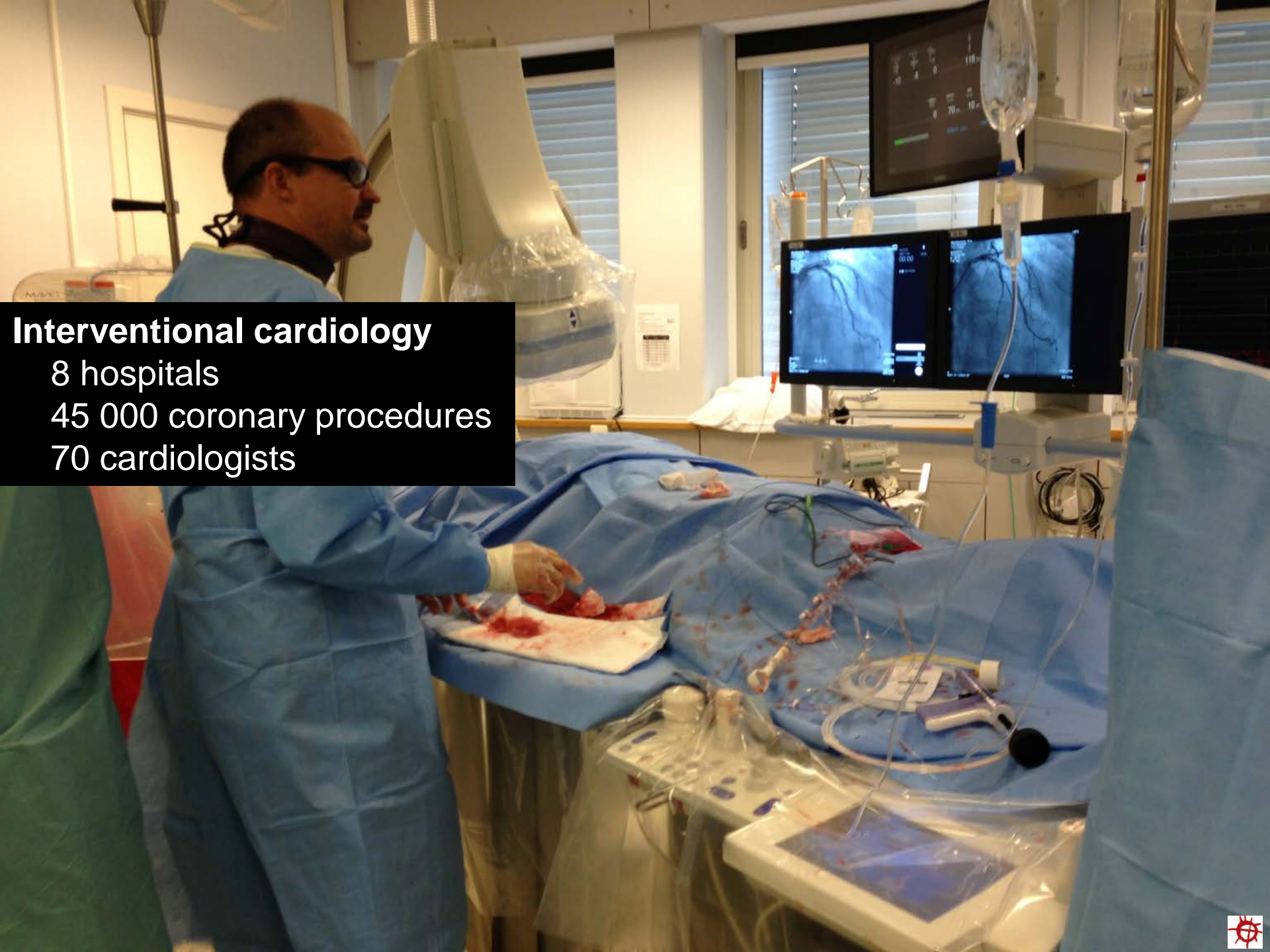
Silkoset RD, Senioradviser  
Widmark A, Senioradviser  
Friberg EG, Head of section

Section for Medical Applications  
Norwegian Radiation Protection Authority



Statens strålevern  
Norwegian Radiation Protection Authority

[www.nrpa.no](http://www.nrpa.no)



**Interventional cardiology**  
8 hospitals  
45 000 coronary procedures  
70 cardiologists

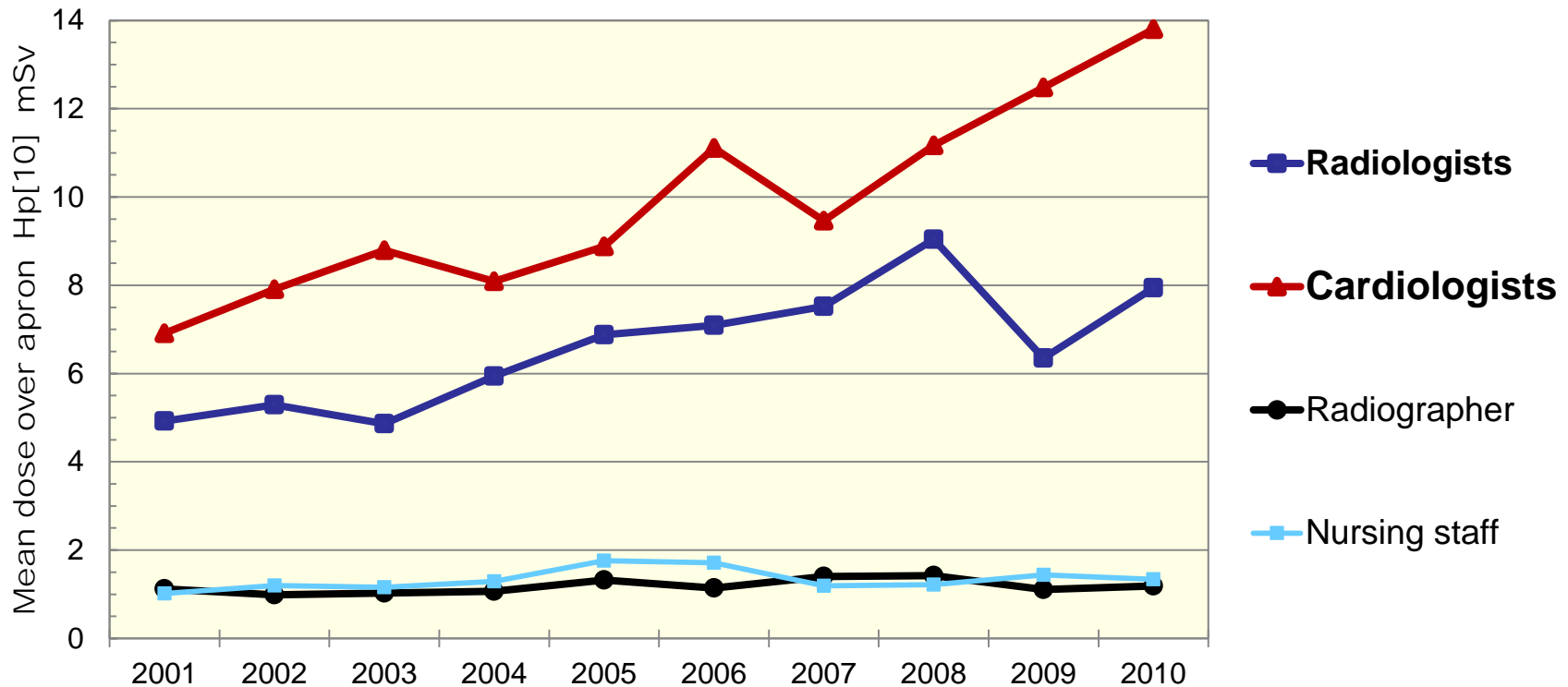


# Why inspections in Cardiology?

- 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



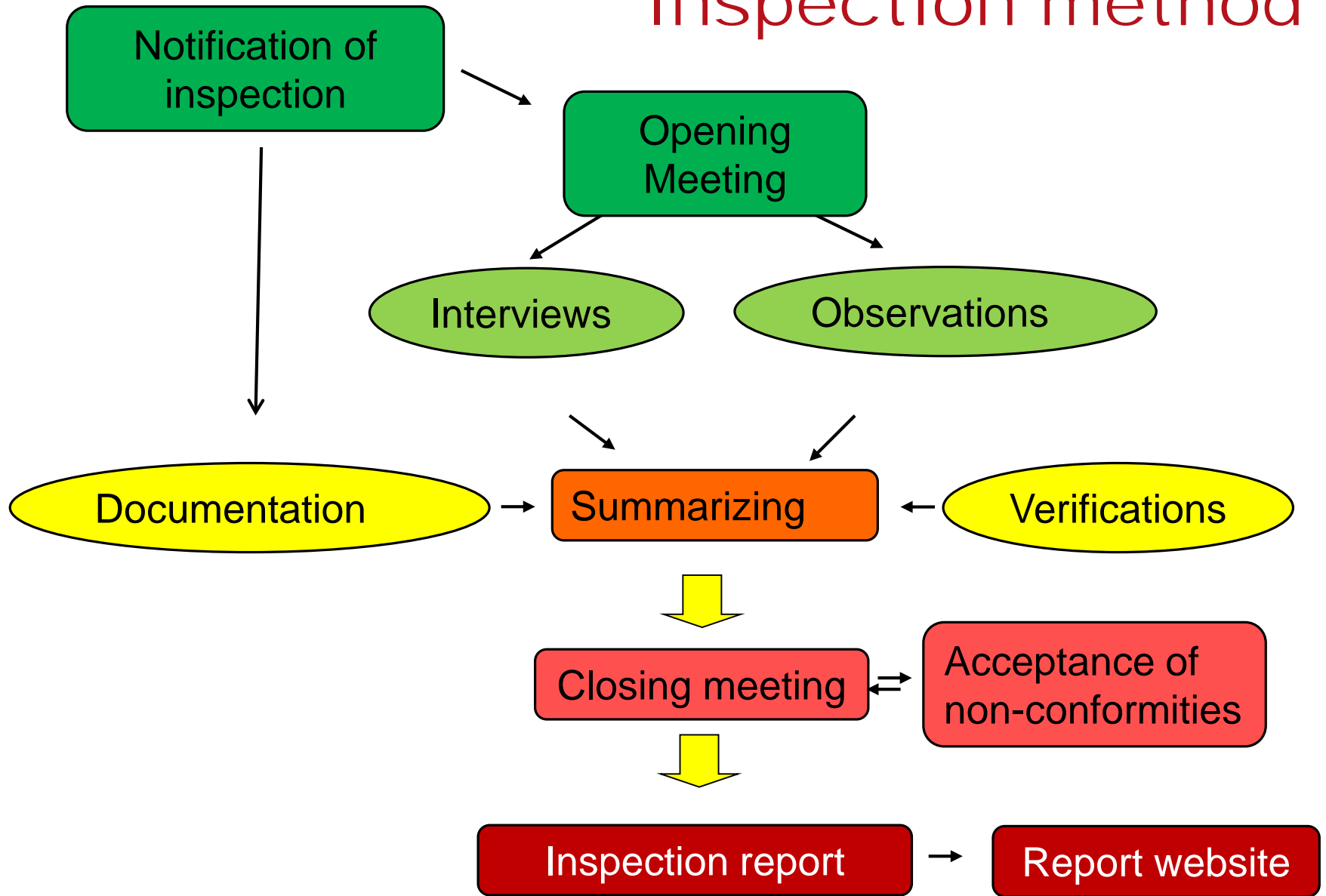
# Personal doses for Medical staff in Norway



Development of mean doses over apron ( $D > 0$  mSv) for medical staff in the period 2001-2010  
(NRPA Report 2011:11)



# Inspection method





# Topics

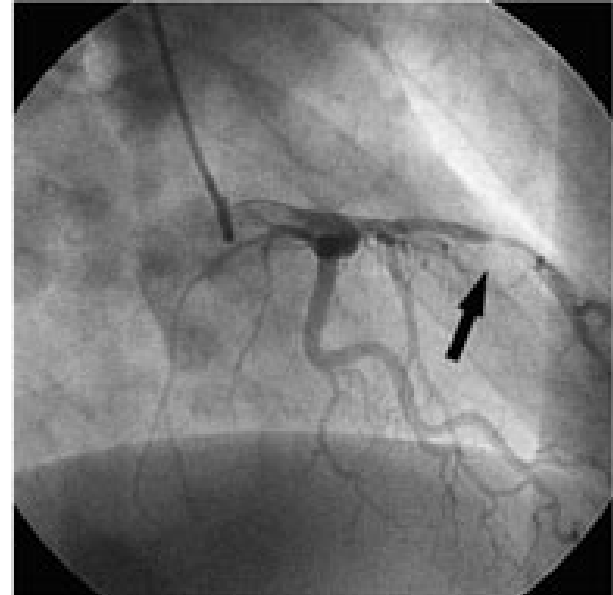
- Justification
- Optimisation
- Protection of staff and patients
- Personal dosimetry
- Organisation of the radiation protection (RP)
- Education and training in RP
- Quality control



# Documents

Local standard dose  
- Coronary angiography:

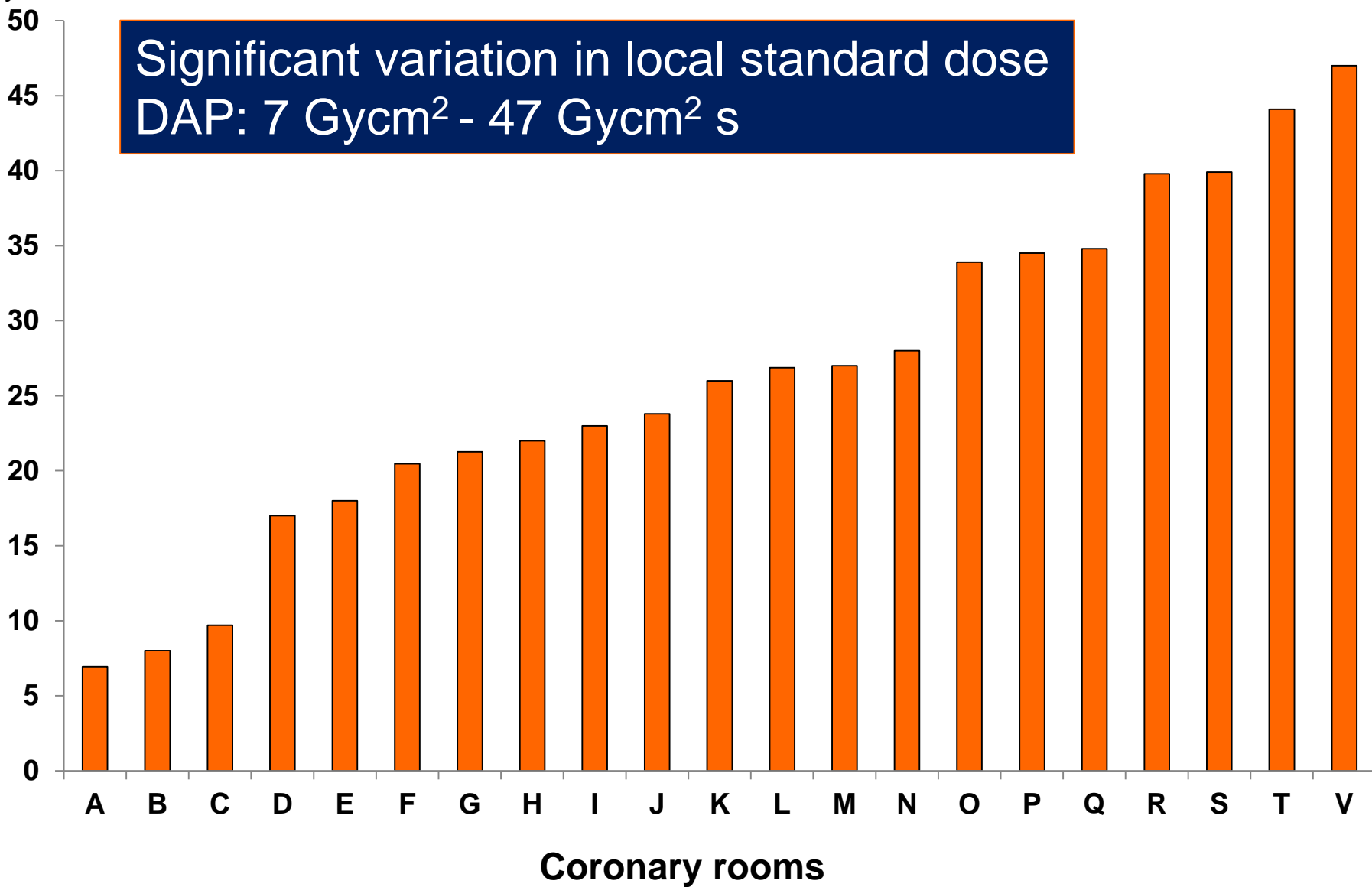
- 20 patients
- 55–90 kg
- DAP (Gycm<sup>2</sup>)



Coronar angiography  
Tidsskrift for Den norske legeforening,  
2006

Dose  
Gycm<sup>2</sup>

Significant variation in local standard dose  
DAP: 7 Gycm<sup>2</sup> - 47 Gycm<sup>2</sup> s





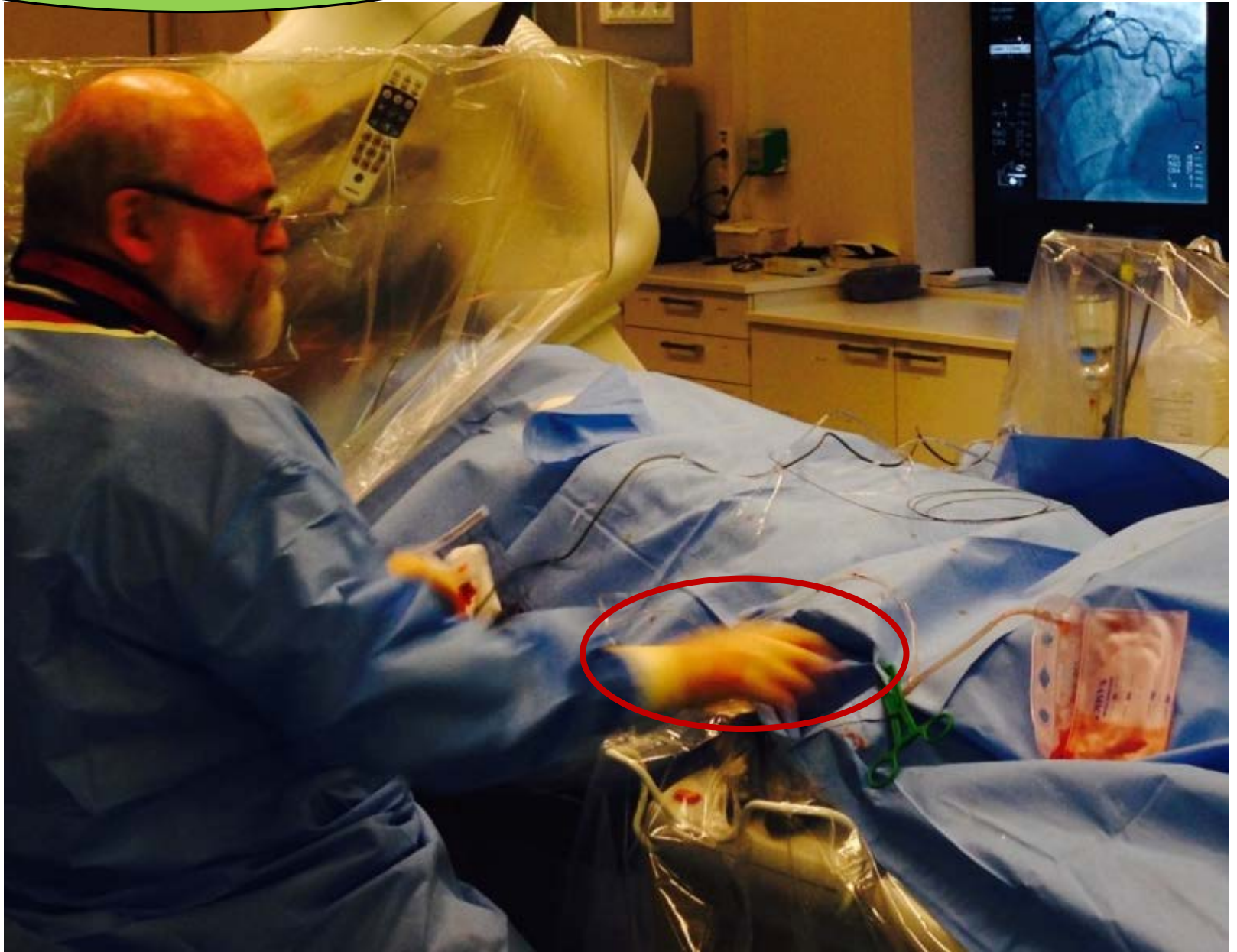
# Observations



Work technique  
Shielding  
Exposure parameters



# Observations





# Observations



# Use power injectors for contrast

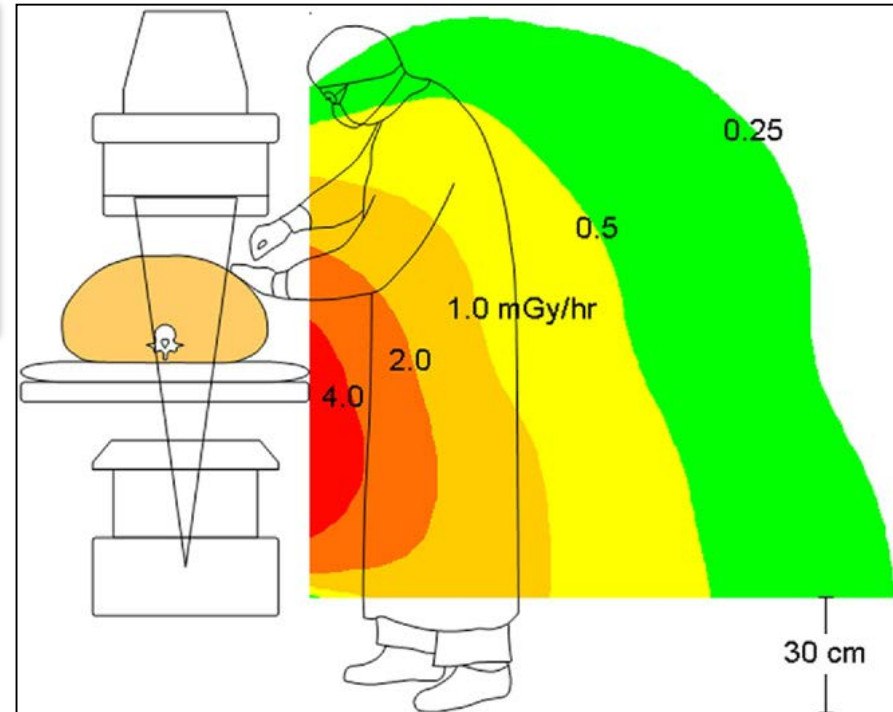
## Original article

**Step back from the patient: Reduction of radiation dose to the operator by the systematic use of an automatic power injector for contrast media in an interventional angiography suite**

Anne Sofie F Larsen<sup>1</sup> and Bjørn Helge Østerås<sup>2,3</sup>

<sup>1</sup>Østfold Hospital Trust, Department of Radiology; <sup>2</sup>The Intervention Centre, Oslo University Hospital, Oslo; <sup>3</sup>Faculty Division of Clinical Medicine, University of Oslo, Oslo, Norway

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



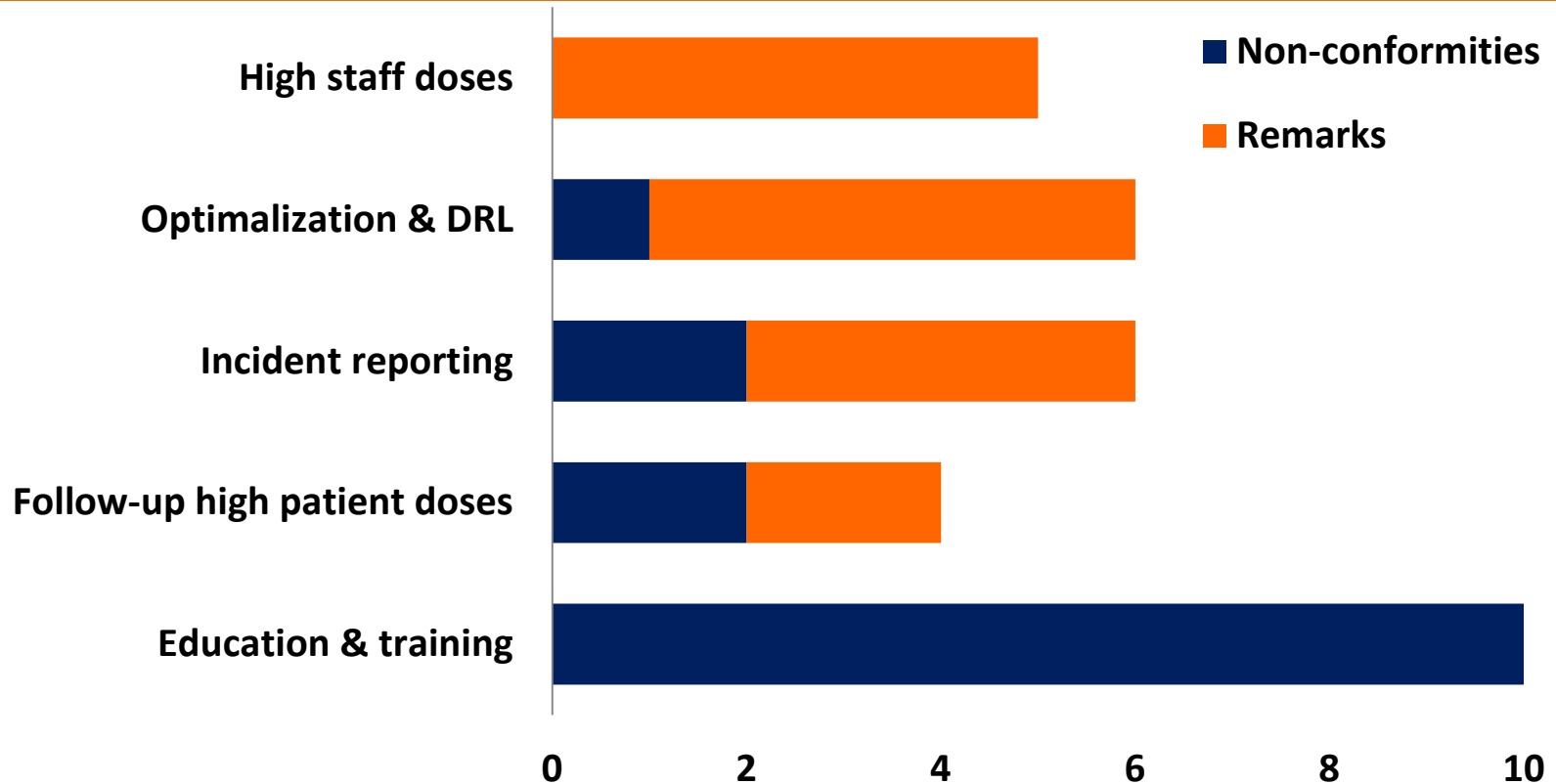
Schueler BA. Tech Vasc Interv Radiol. 2010;13:167–71



# 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

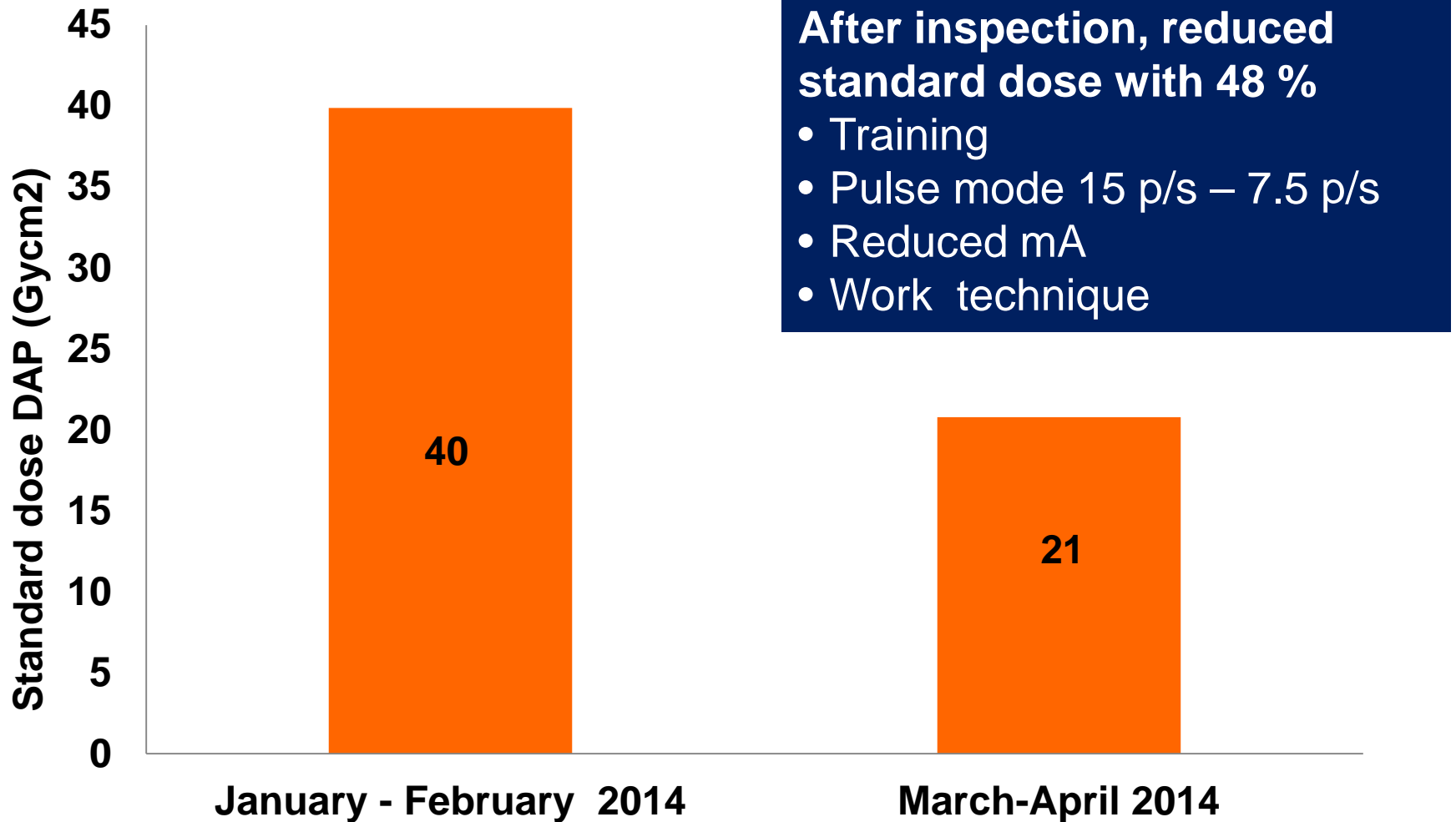


**Total: 17 non-conformities & 23 remarks**



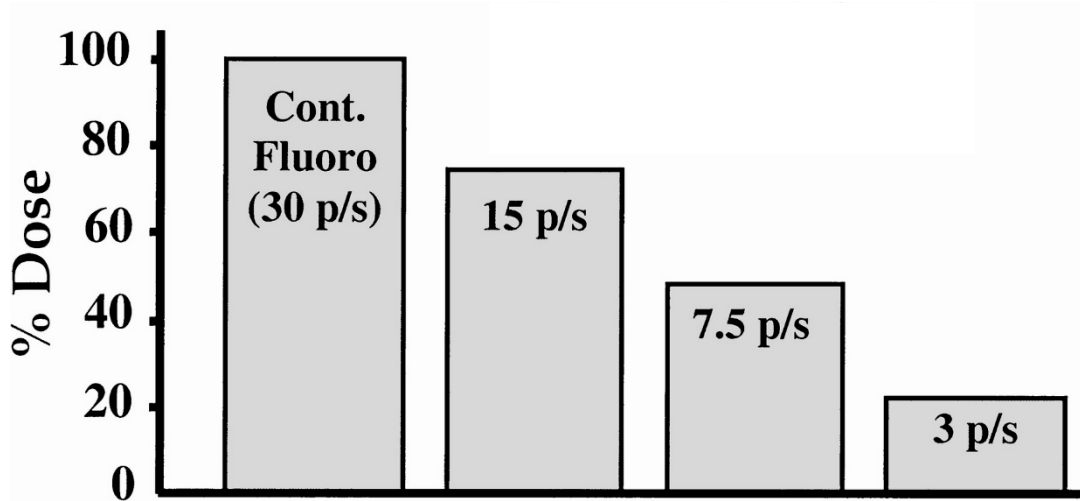
# Optimisation at one hospital

## - Coronary angiography



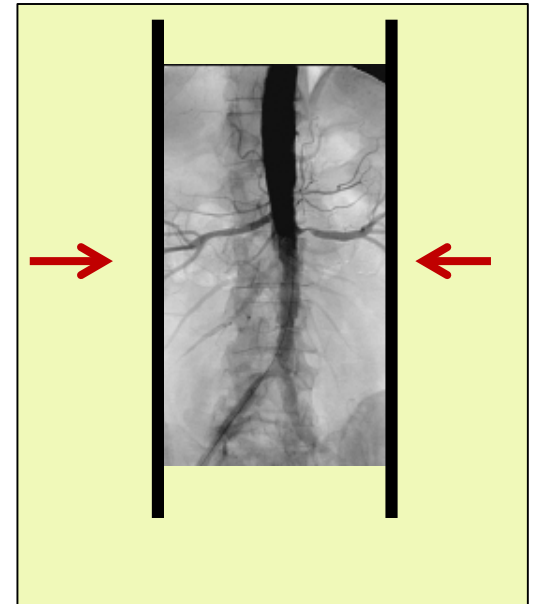
# Dose reduction technologies

- Pulsed fluoroscopy



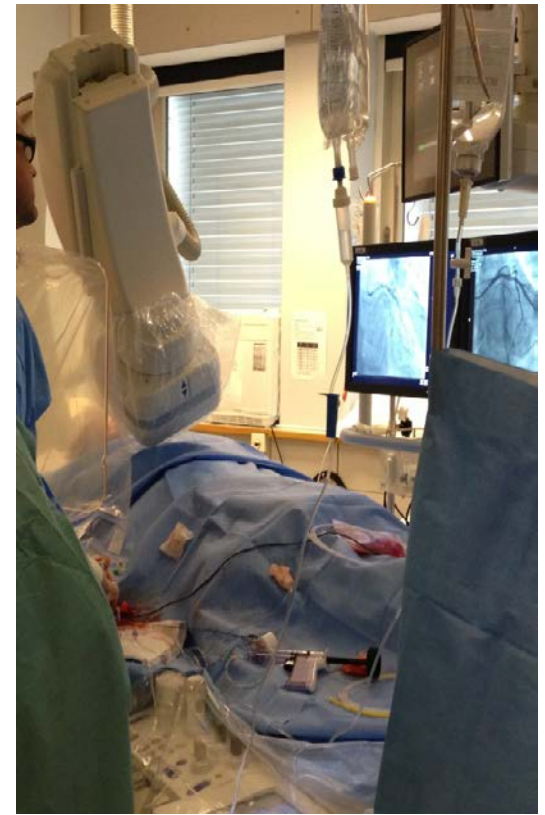
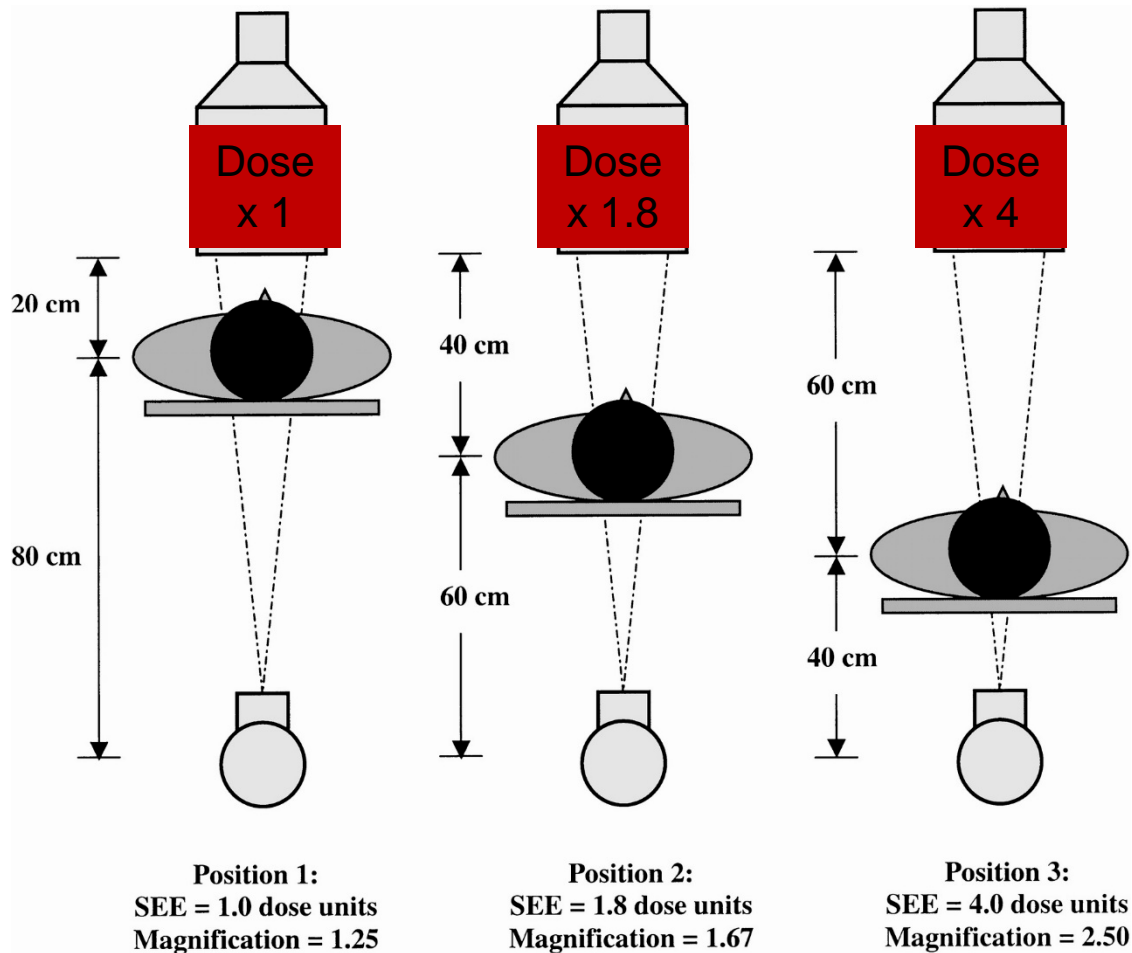
Mahesh M. Radiographics 2001;21:1033-1045

- Collimation





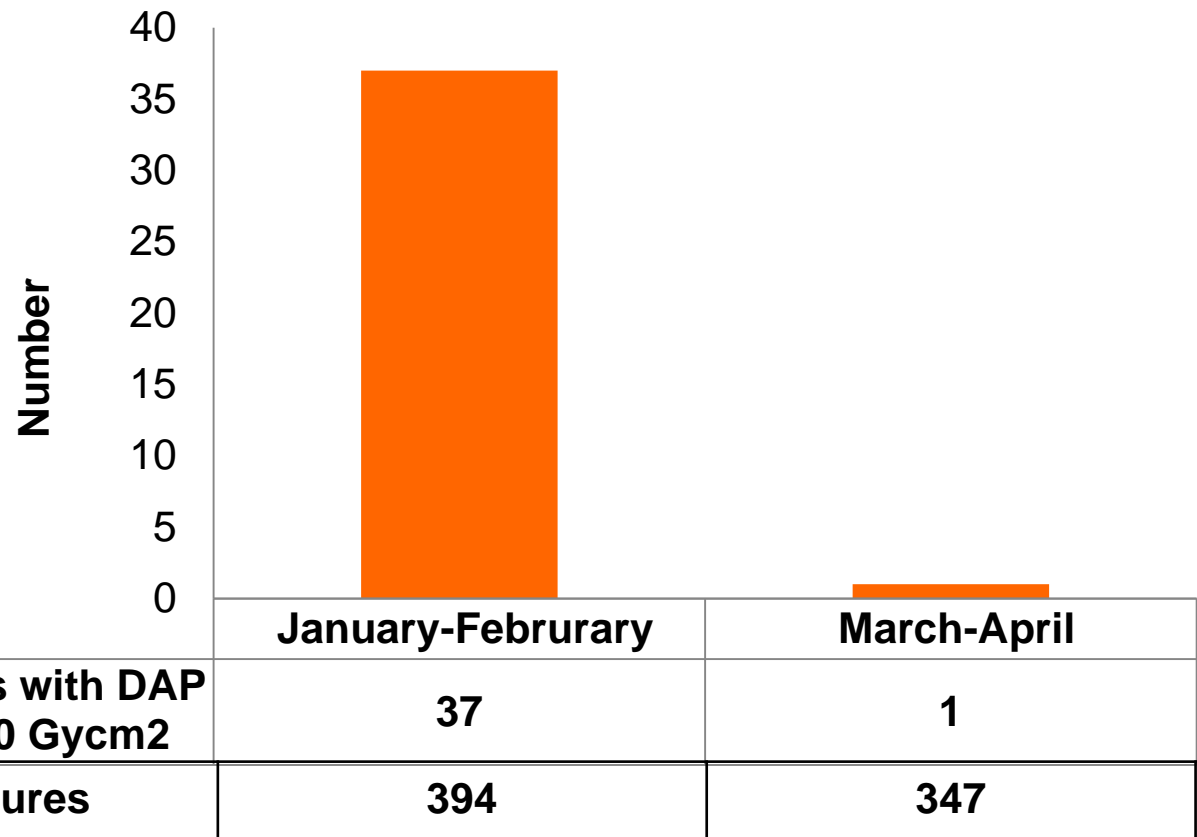
# Effect of geometric magnification on entrance skin dose



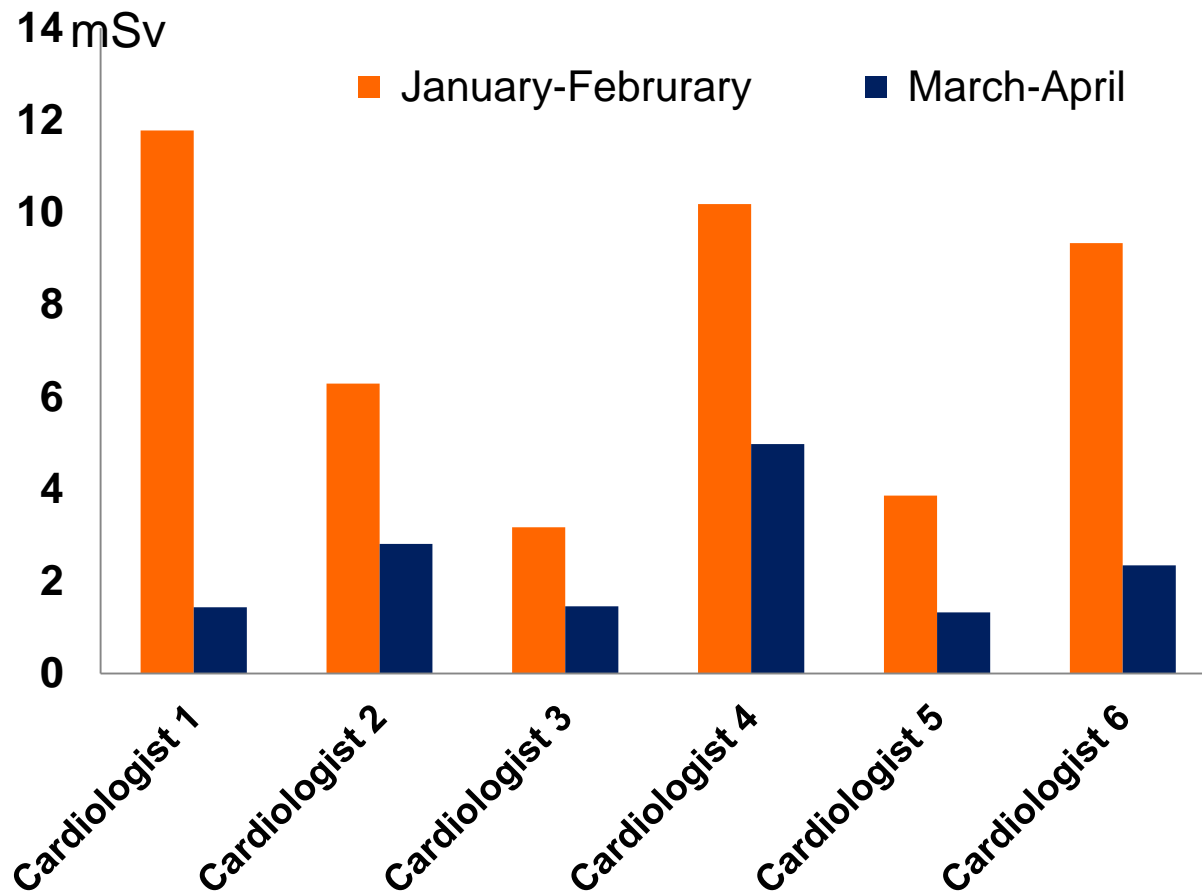
Keep the X-ray tube as far as possible from the patient and the image receptor as close as possible to the patient.



# Decreased number of high patient doses



# 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

Mean score (1-5)

Do you agree with the non-conformities and remarks given at the closing meeting?



**3.9**

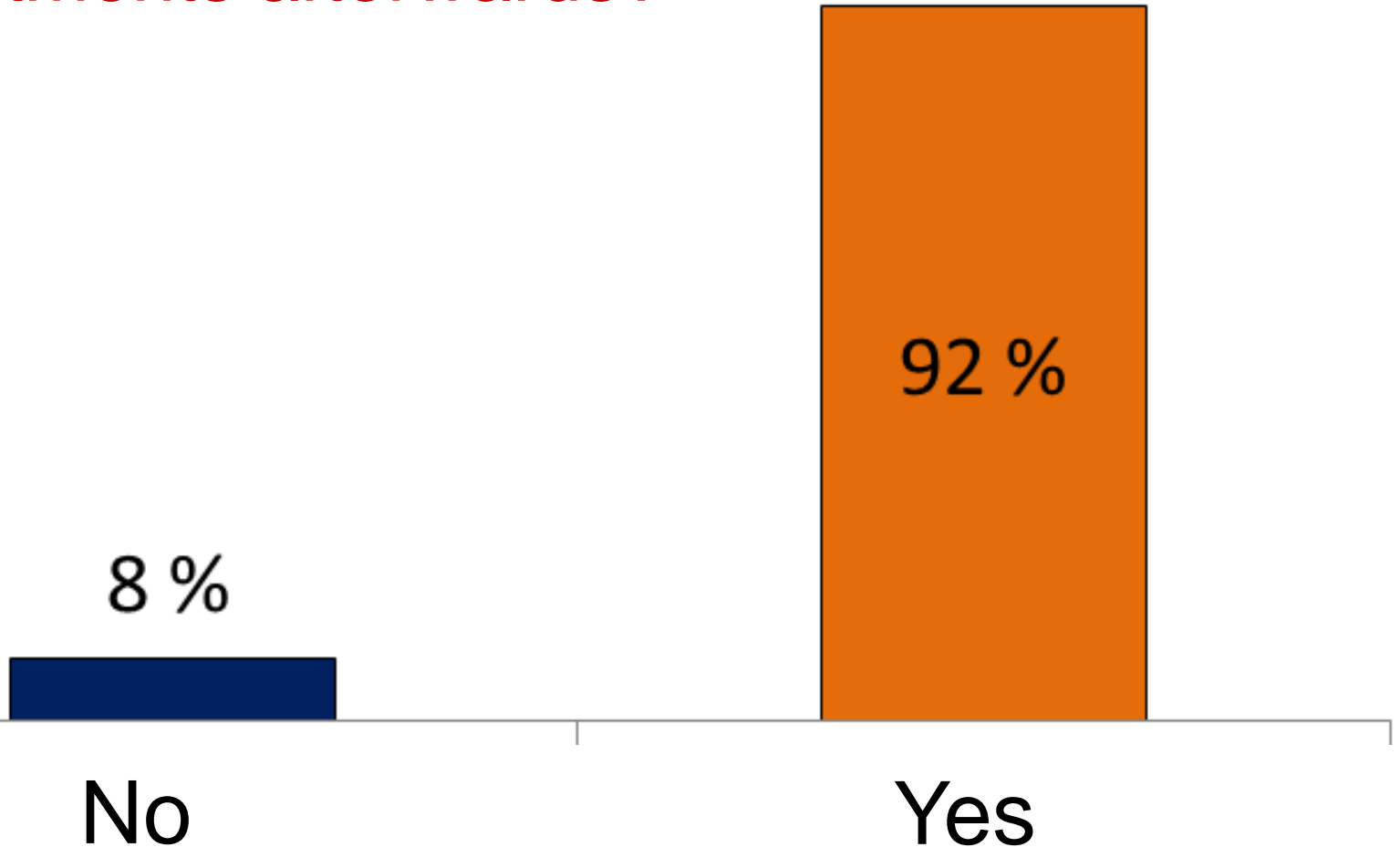
What is your total impression of the inspection?



**4.4**



Did the inspection bring any changes in the departments afterwards?



# 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

