Workstation analysis: radiation protection in conventional radiology, radiotherapy and nuclear medicine

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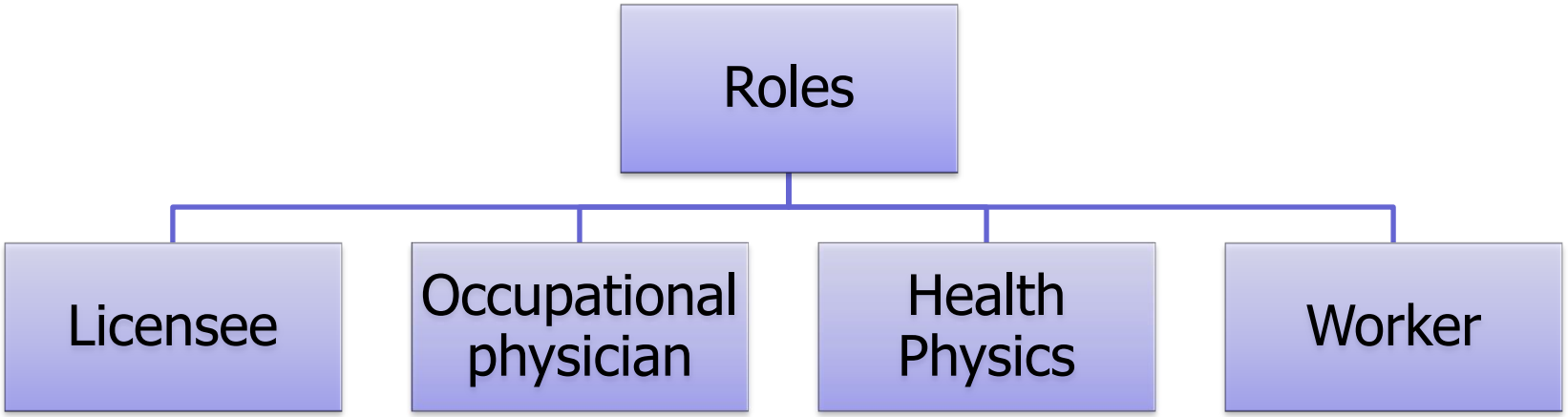
- Workstation analysis
- General risks
- Issues in radiology
- Are there any issues in radiotherapy?
- What about nuclear medicine?

Work station analysis



Work station analysis

Since 1965

Work station analysis

Aim

Lower the doses of the worker

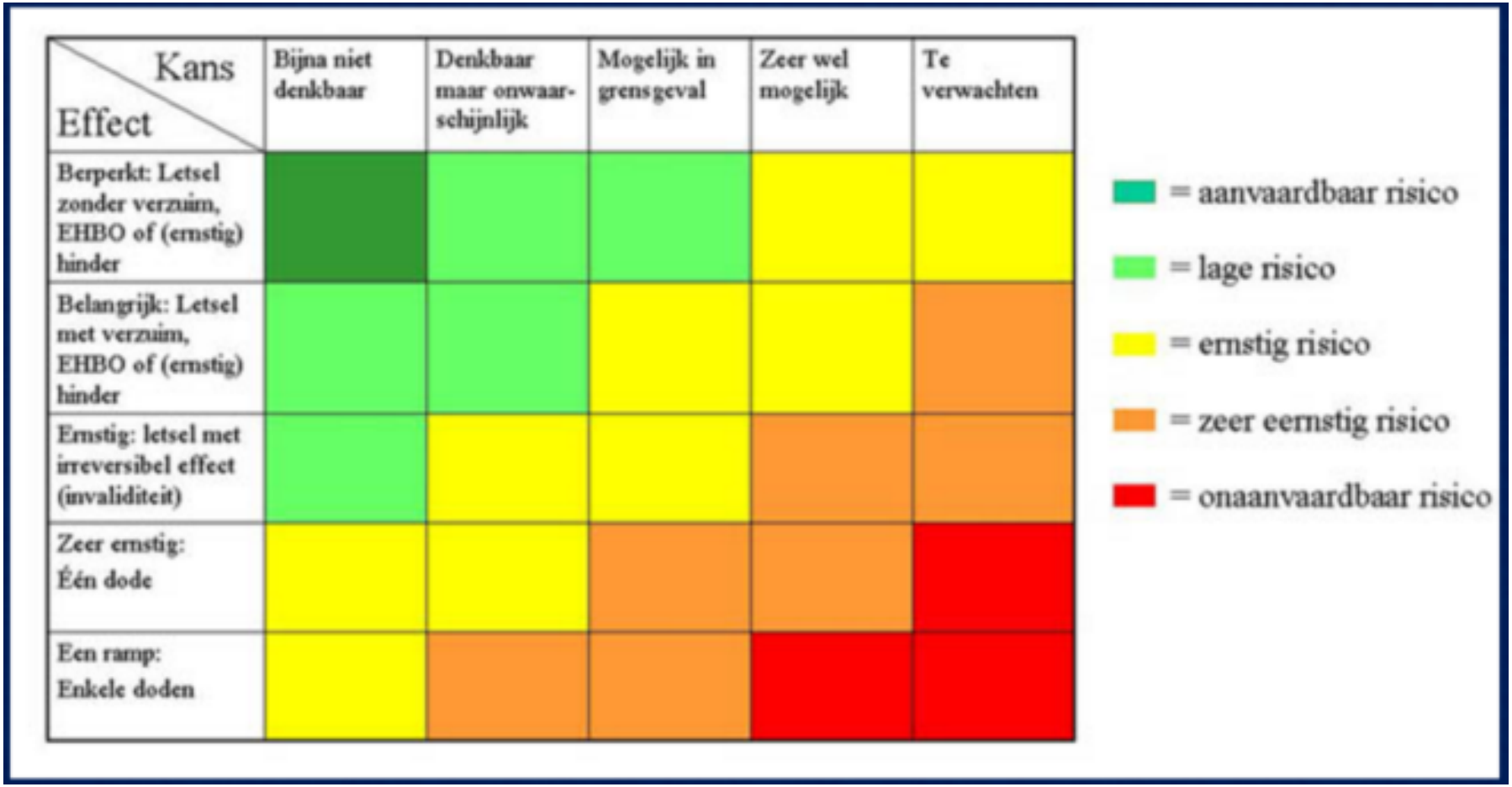
ALARA

Work station analysis

Quantification?

Since 1965

Work station analysis



Kans / Effect	Bijna niet denkbaar	Denkbaar maar onwaar-schijnlijk	Mogelijk in grensgeval	Zeer wel mogelijk	Te verwachten
Berperkt: Letsel zonder verzuim, EHBO of (ernstig) hinder					
Belangrijk: Letsel met verzuim, EHBO of (ernstig) hinder					
Ernstig: letsel met irreversibel effect (invaliditeit)					
Zeer ernstig: Één dode					
Een ramp: Enkele doden					

= aanvaardbaar risico

= lage risico

= ernstig risico

= zeer eernstig risico

= onaanvaardbaar risico

Work station analysis

Effect	E1 Gering	E2 Klein	E3 Gemiddeld	E4 Groot	E5 Catastrofaal
Personen	EHBO voorval zonder verzuim	Kortdurend verzuim (< 4 weken)	Langdurig verzuim (> 4 weken)	Blijvend letsel, dode	Meerdere doden
Materiaal	Geringe schade < 1000 Euro	Euro 1000 - 10000	Euro 10000 - 50.000	Euro 50.000 - 25.000.000	Euro > 25.000.000
Milieu	Kleine lekkage binnen opvang systeem	Grote lekkage binnen opvang systeem	Lekkage buiten opvang systeem	Ernstige milieuschade in directe omgeving	Ernstige milieuschade over groter gebied.

AFTER THE PHILOSOPHY…

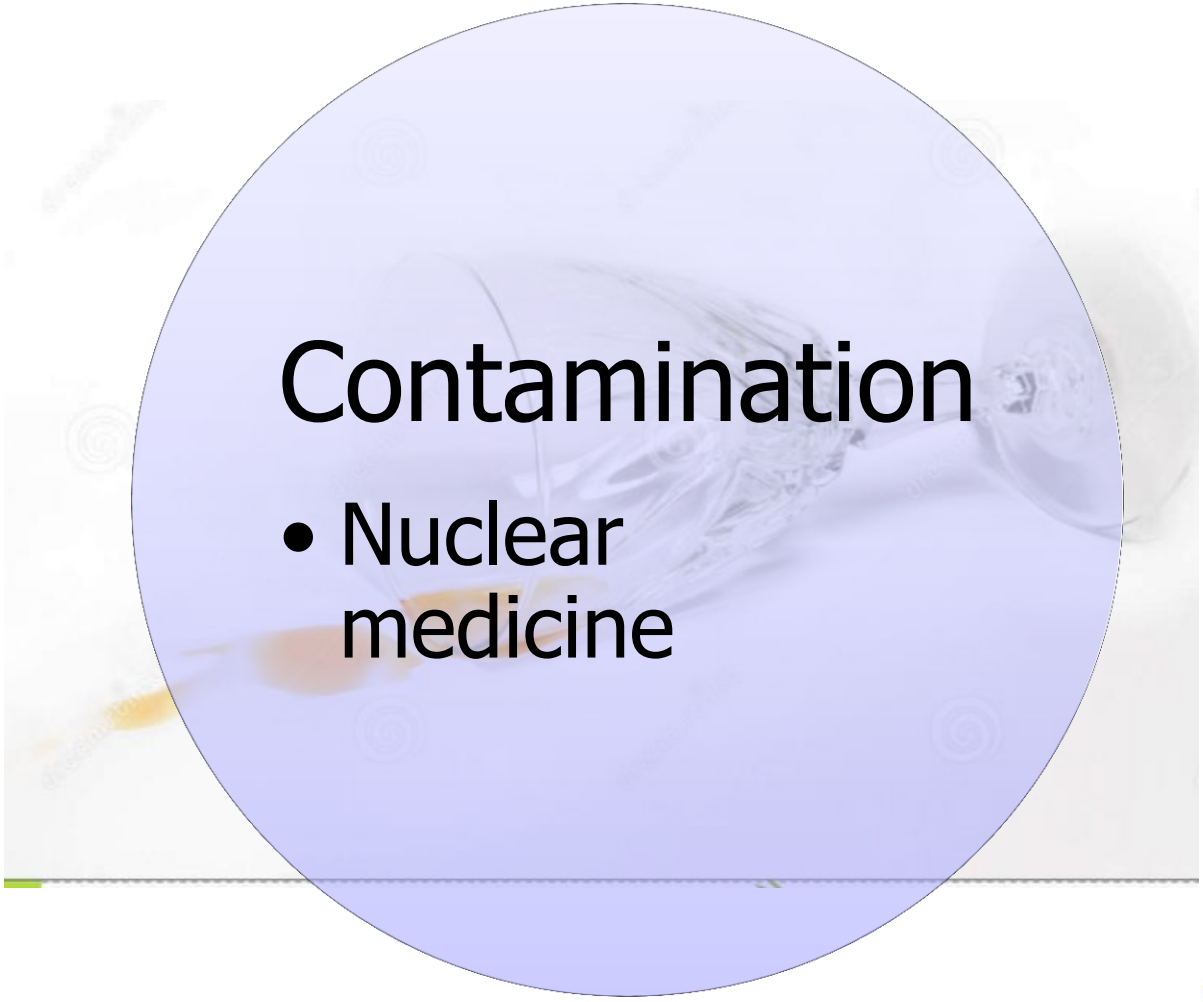
Practical implementation

General risks

Exposure

- Radiology
- Radiotherapy
- Nuclear medicine

General risks

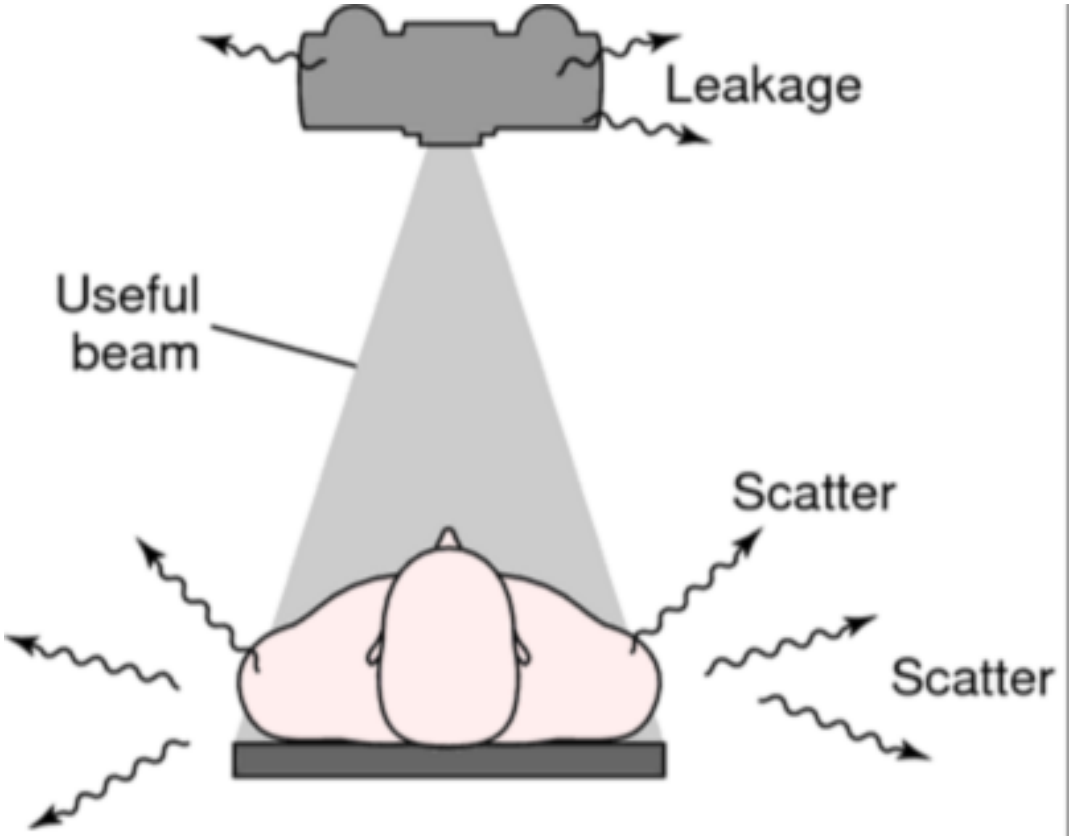


Contamination

- Nuclear medicine

ISSUES IN RADIOLOGY

Scattered radiation

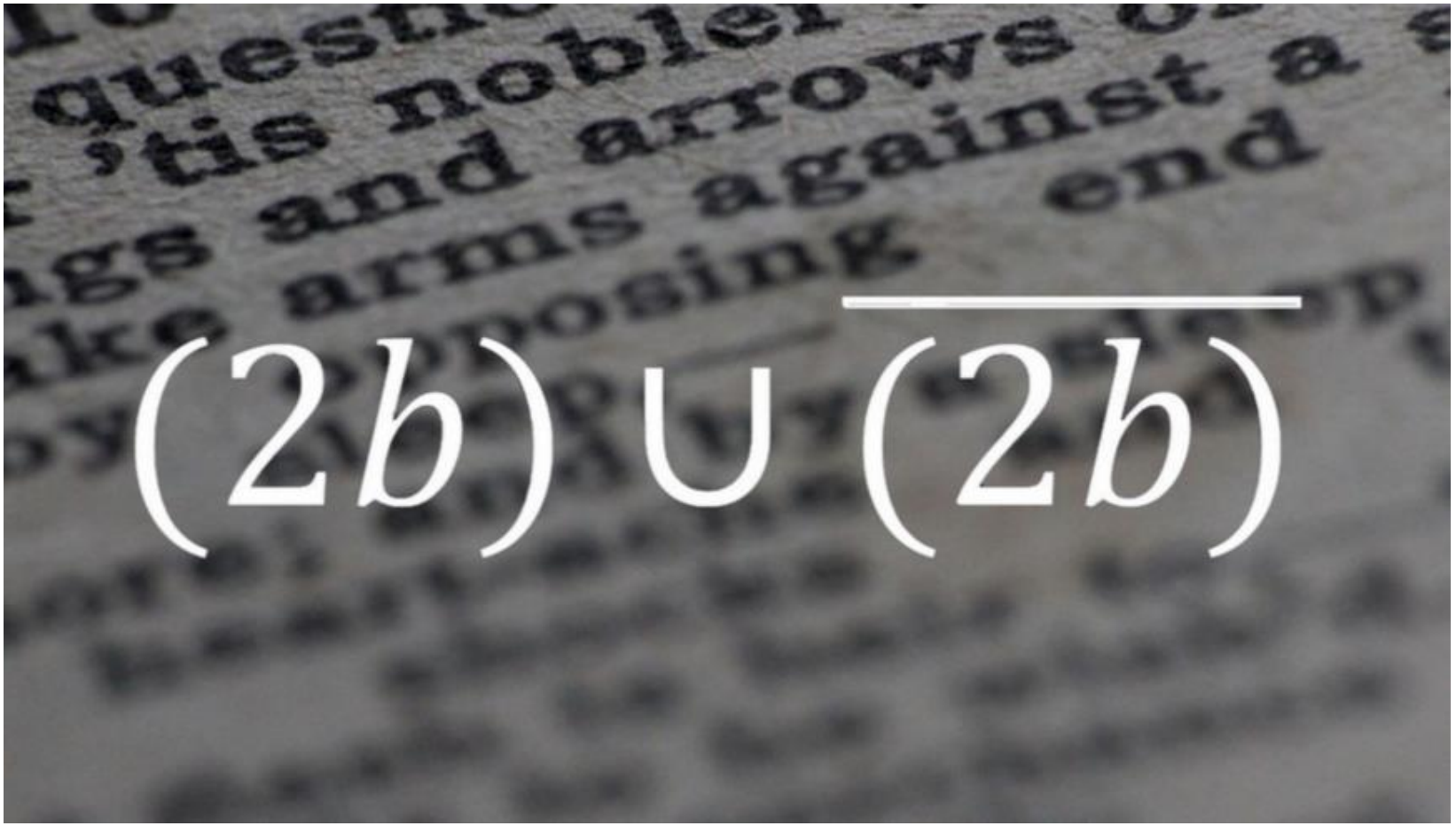


Three types of radiation—the useful beam, leakage radiation, and scatter radiation. From Bushong, 2001.

Scattered radiation

- Room design is important
- Positioning of all the staff behind the screens
- Signalization
- If needed → lead apron

Lead Apron



Lead Apron

Lead or No-Lead

Since 1965

Lead Apron

Quality control

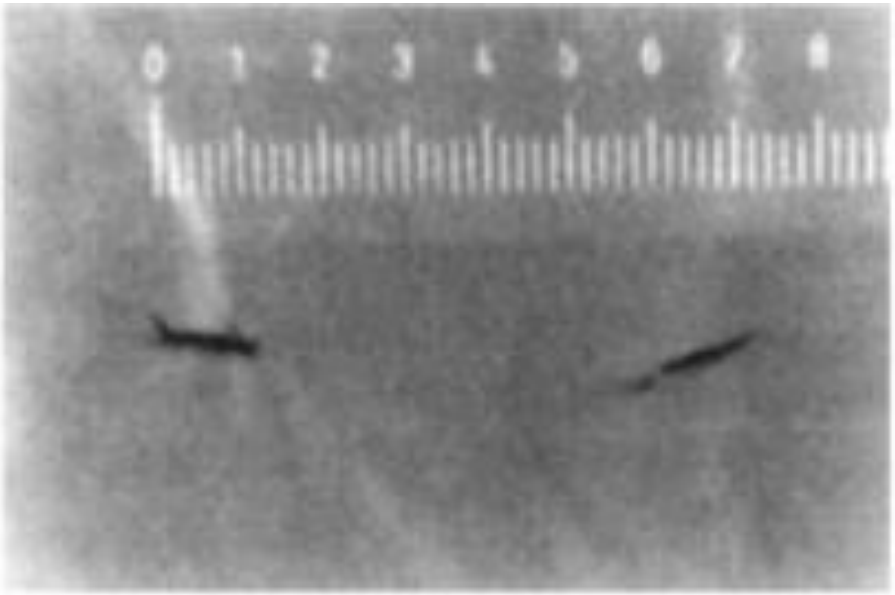


Figure 1. Radiograph of lead apron with cracks. Scale in centimeters.

Lead Apron

Quality control

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Interventionel radiology

Eyelens

150 mSv → 20 mSv

At this moment:

The centers where we are Health Physics

→ Measuring eyelens dose of people at risk to verify the 20 mSv/12 M

ARE THERE ANY RISKS IN RADIOTHERAPY?

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Bunker Design

QA

- Training of the staff
- QC on safety equipment
- Procedures

HDR

- Treatment in bunker or dedicated room
- Accident:
  - Set-up screen
  - Manual
  - EPD
  - Forceps
  - Cutter

  → training!

WHAT ABOUT NUCLEAR MEDICINE?

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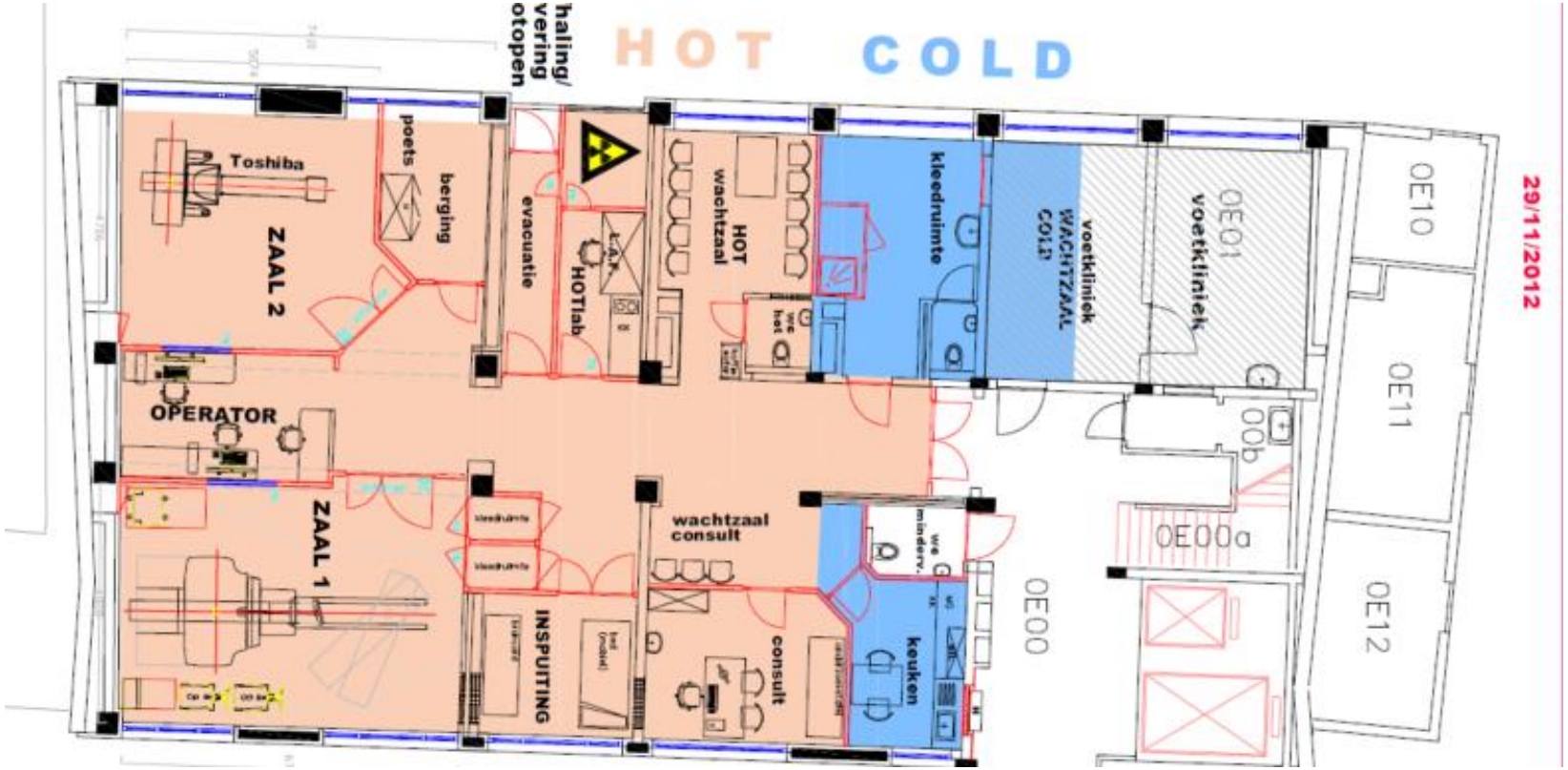
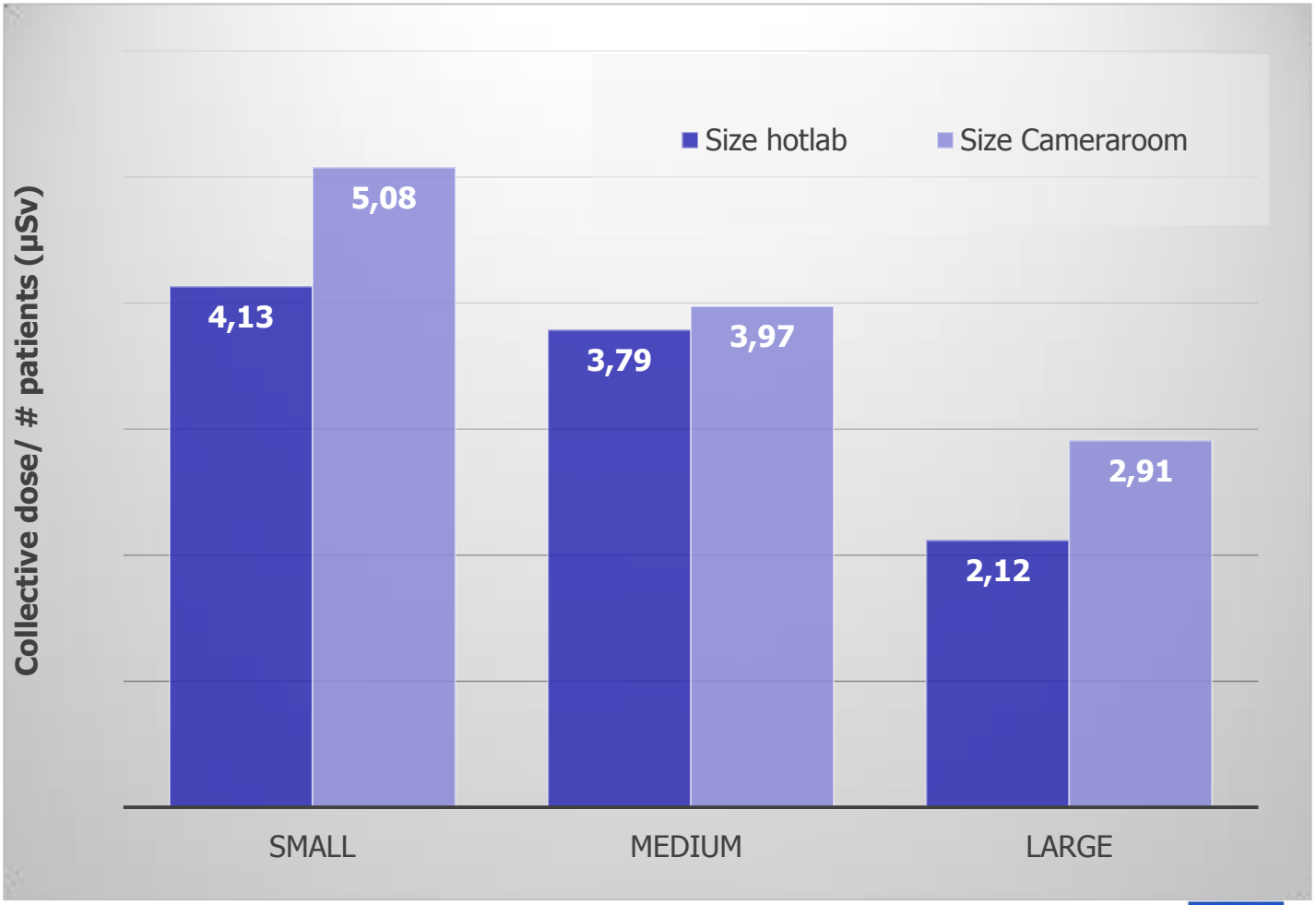
Design



Since 1965

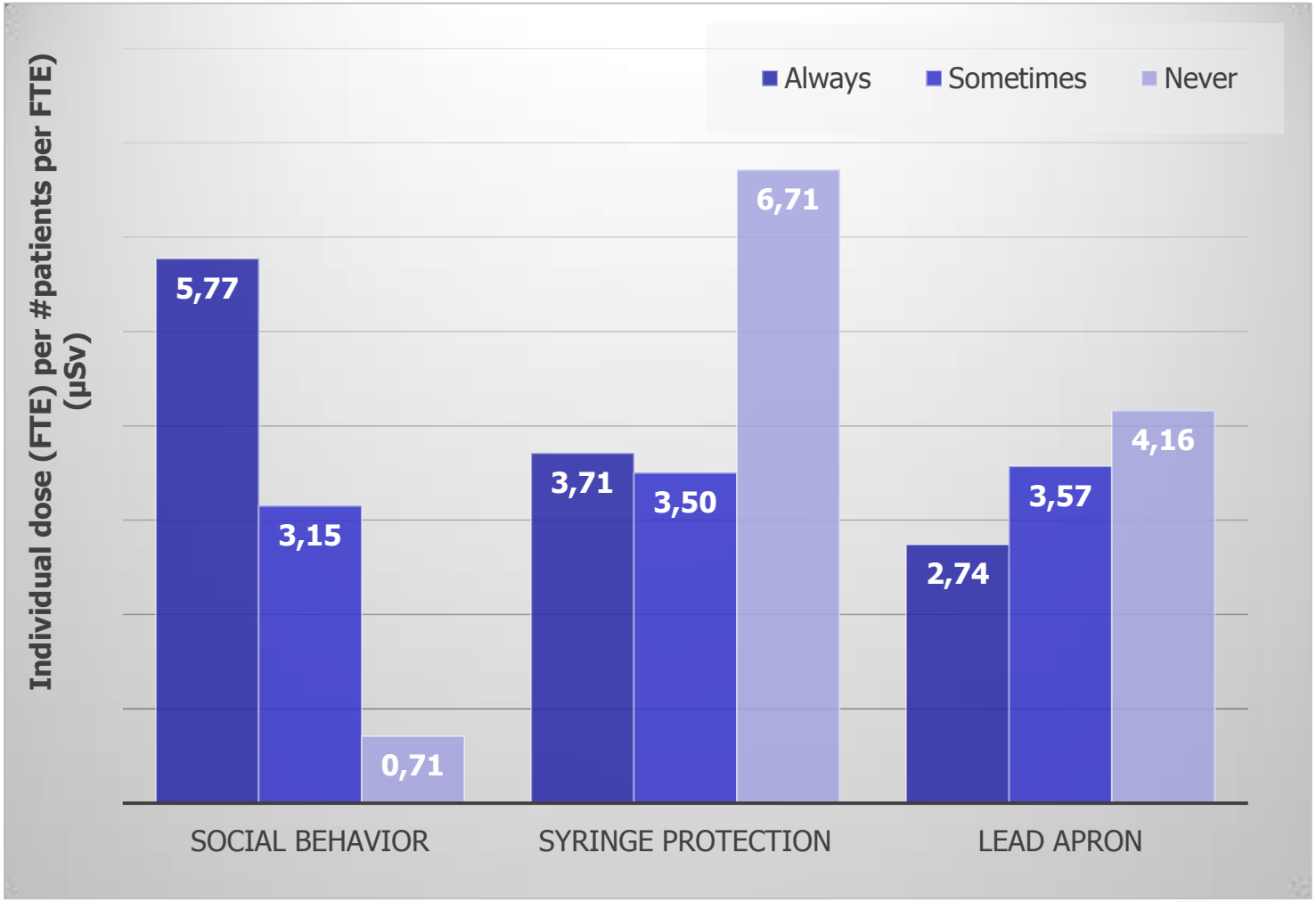
Size hotlab and cameraroom



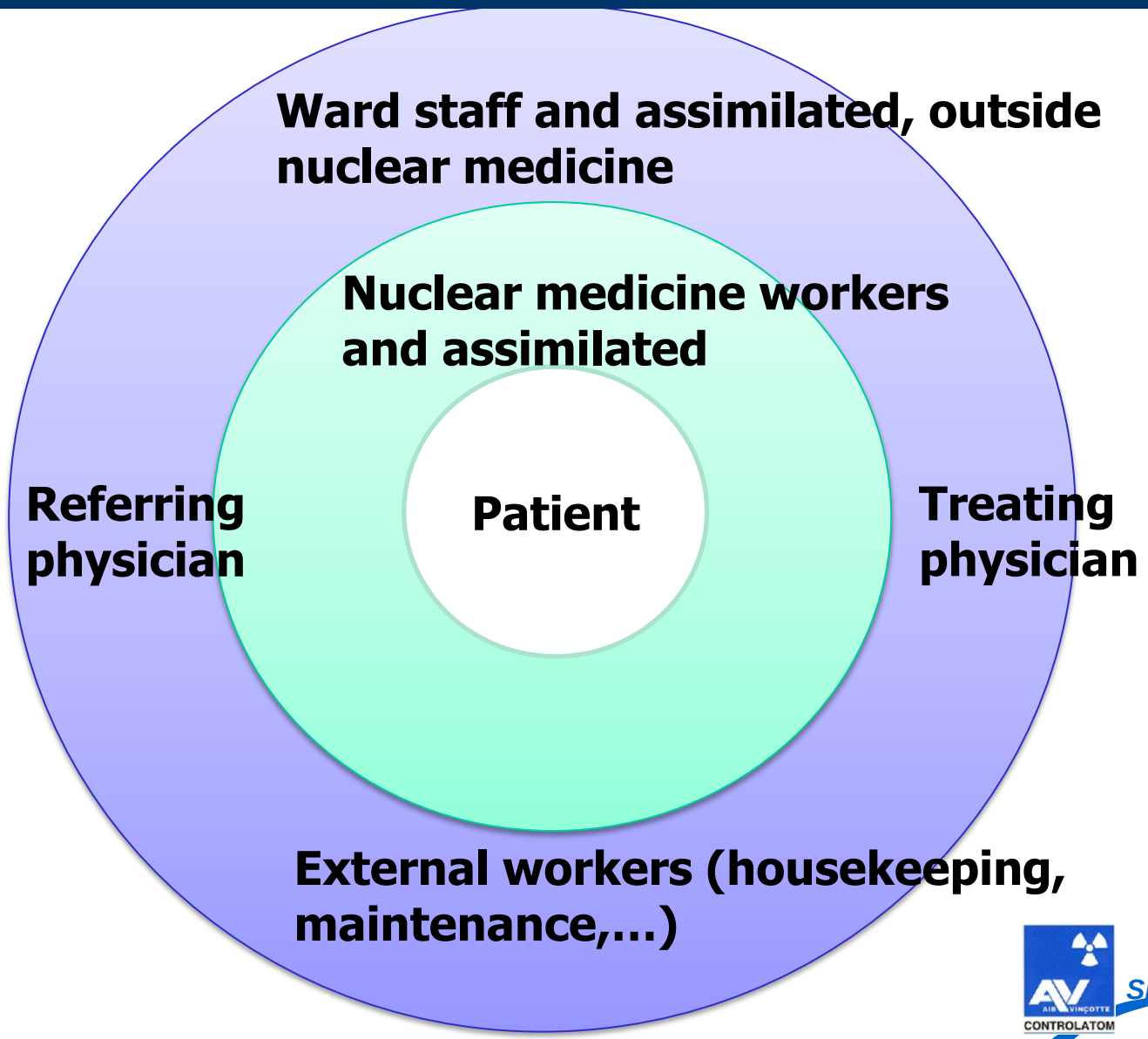
Manipulations at risk

Generator reception	I-131	Preparation of syringes
Preparation of radiopharmaceuticals	Patient injection	Patient installation on camera
CT	Waste	Ventilation

Attitude



Patient walks away with activity…



Information

F / 101021

Hoge Gezondheidsraad

PUBLICATIE VAN DE HOGE GEZONDHEIDSRAAD nr. 8277

Informatie inzake stralingsbescherming voor het personeel rechtstreeks of onrechtstreeks betrokken bij de nucleaire geneeskunde in vivo

This report proposes information tools for all healthcare practitioners involved to some extent with nuclear medicine patients, from the departments themselves to other caregivers and technical staff.

8 mei 2013

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Questions?