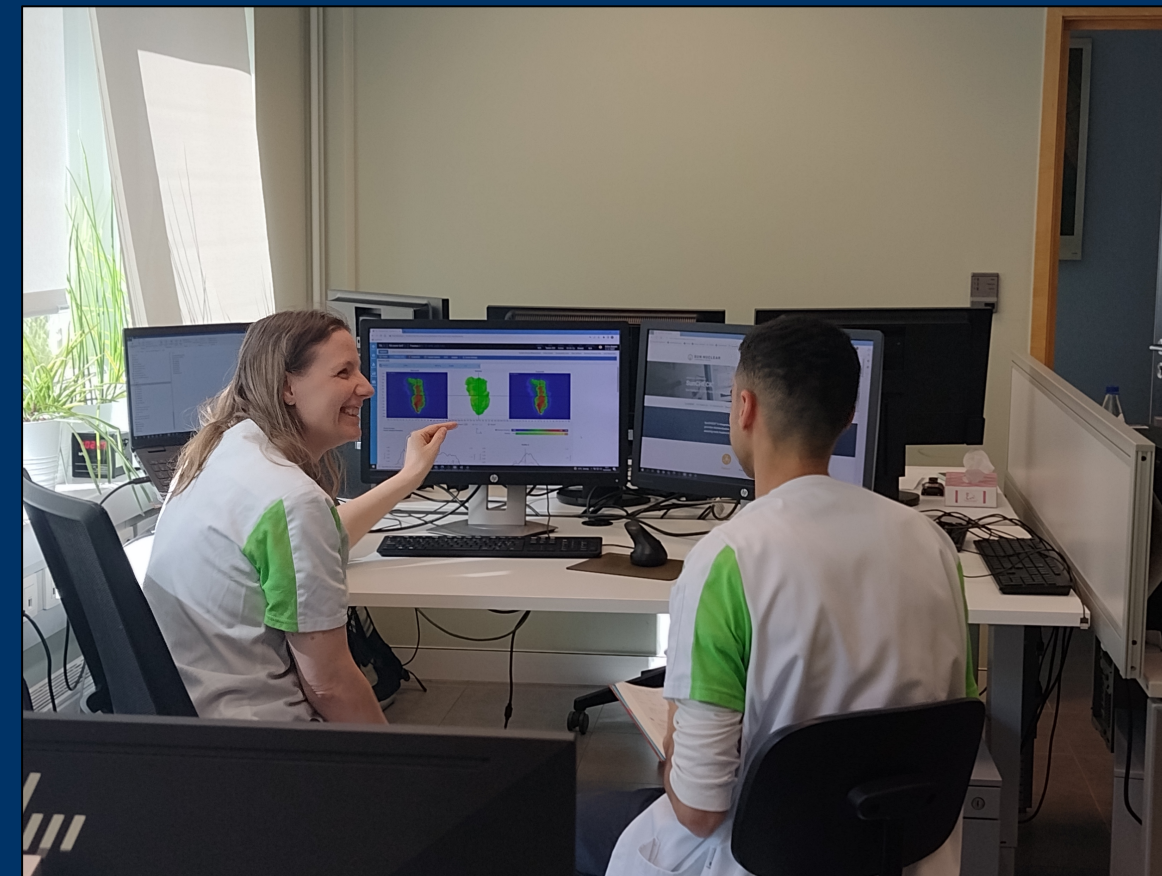




Catalan Clinical Audit
Network for Quality Improvement
in Radiotherapy

The role of the MPE

Prof. Dr. Dirk Verellen

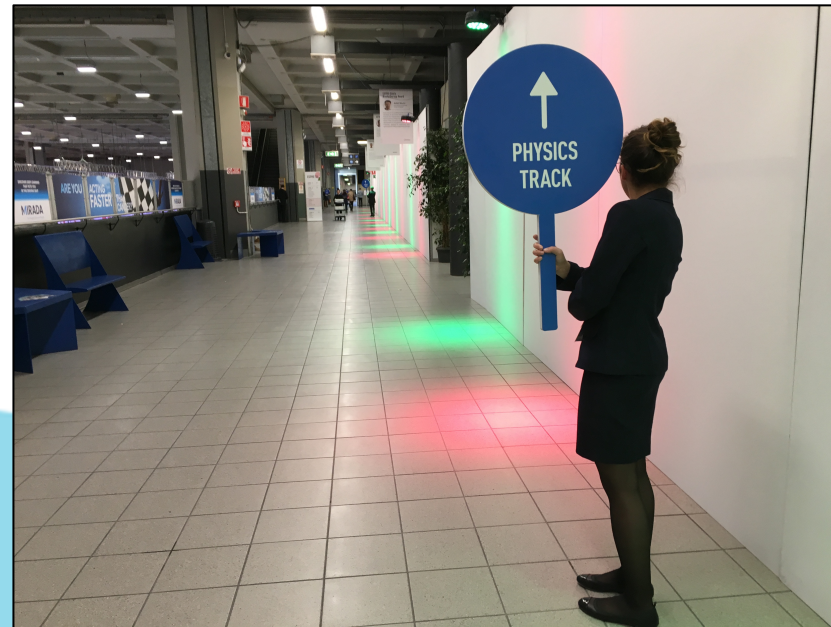


Co-funded by
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Objectives of the lecture

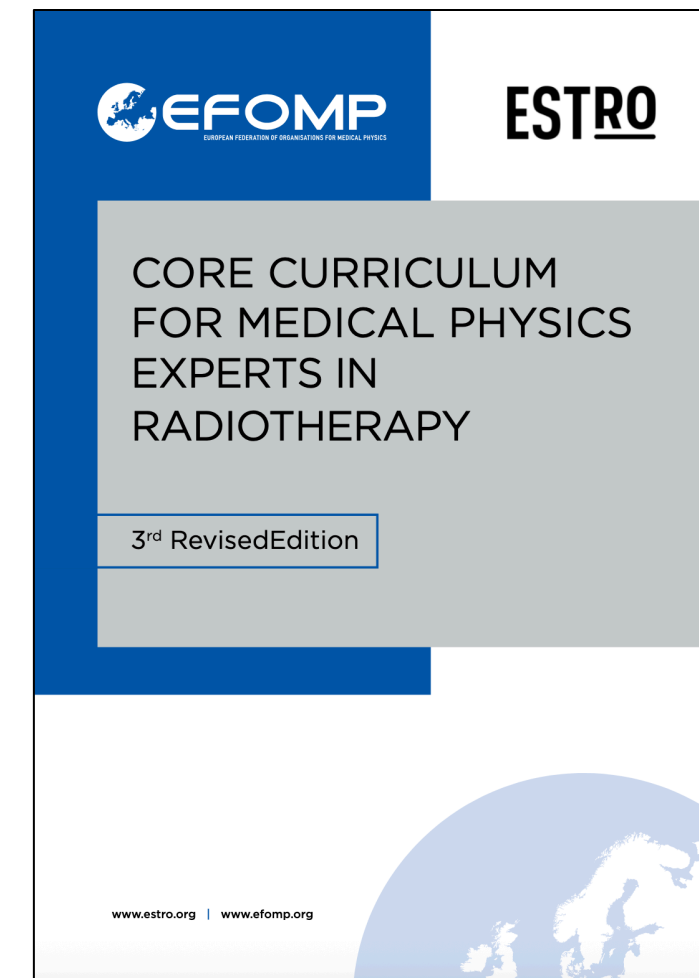
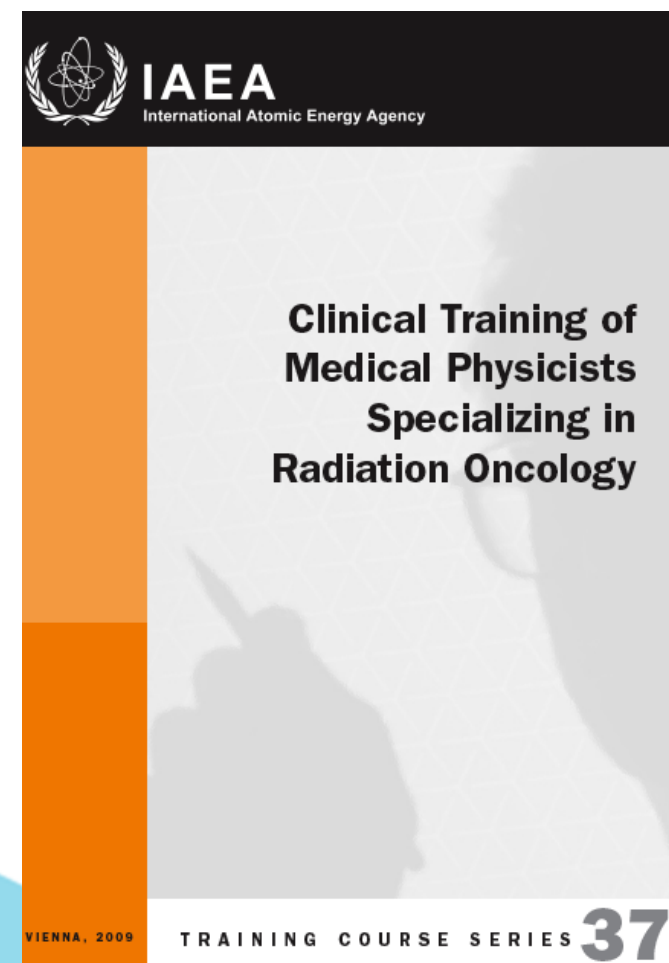
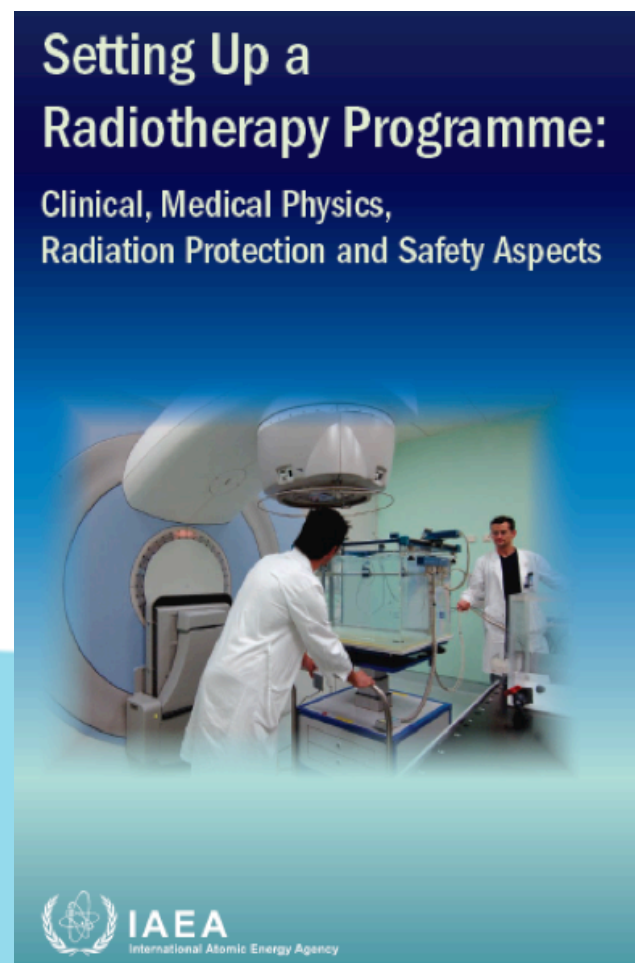
- The roles and responsibilities of an MPE in RT
- The role of the MPE in the audit team



Franquin

The roles and responsibilities of the MPE in radiation oncology

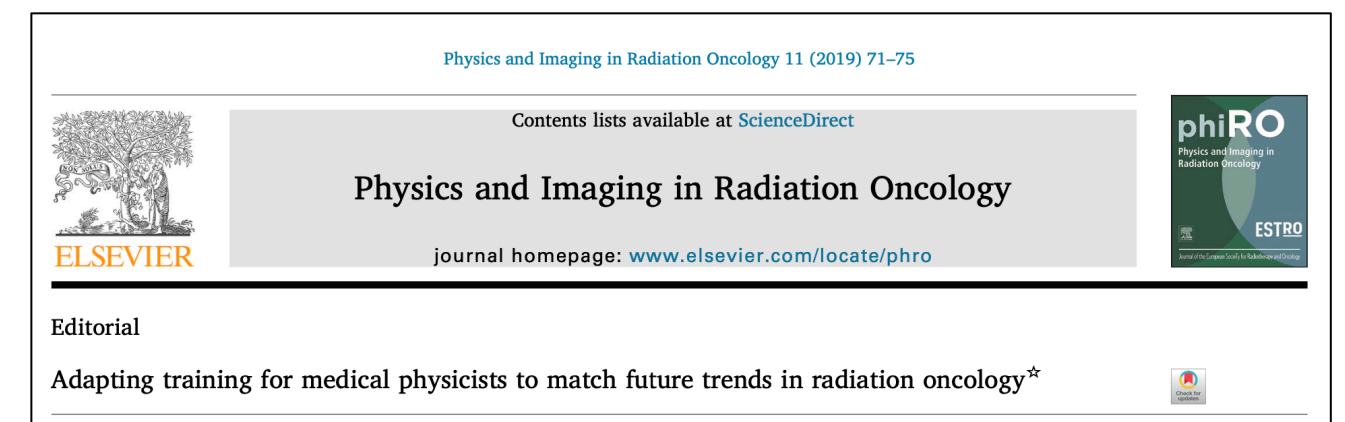
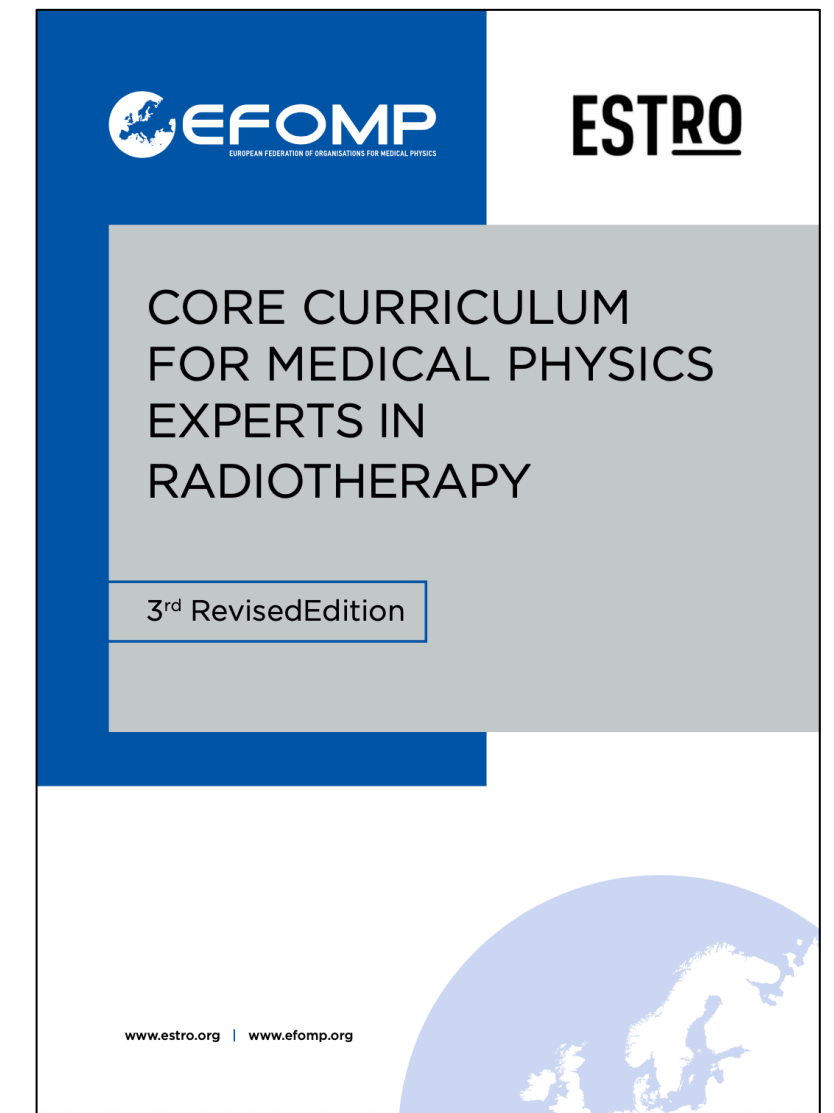
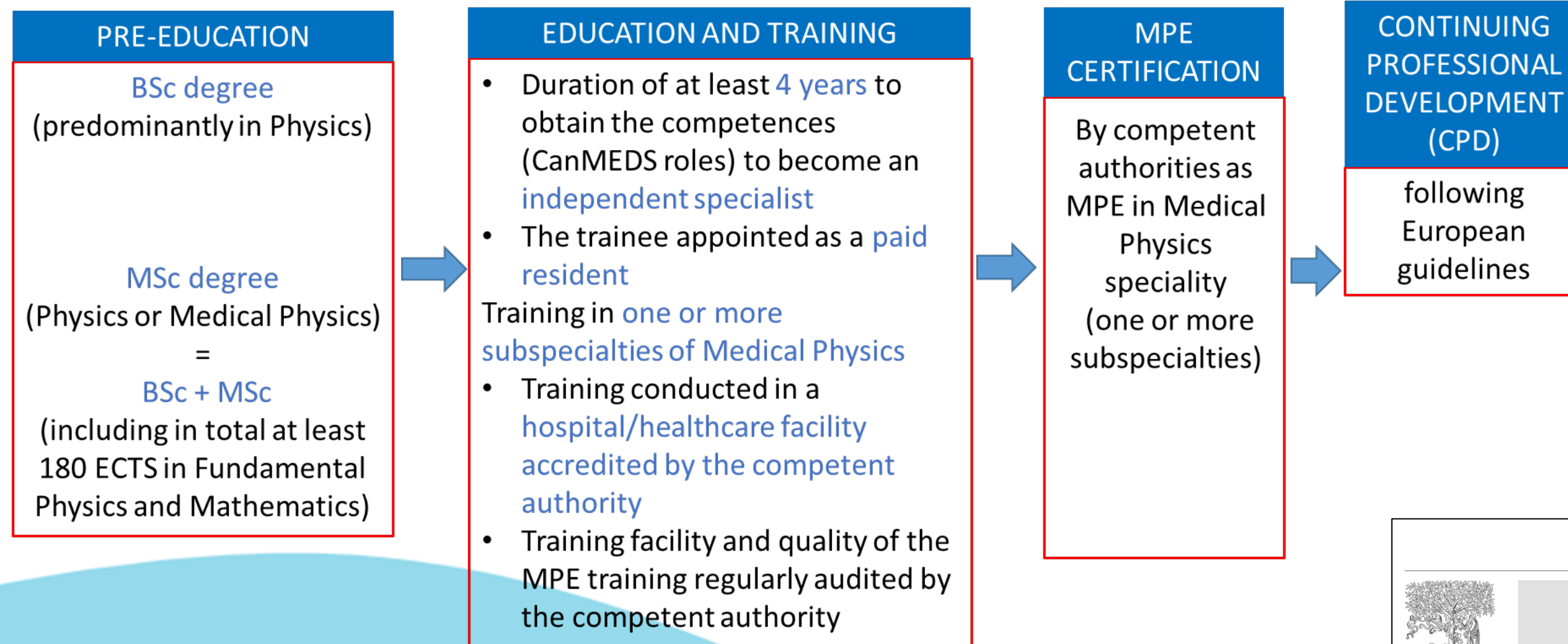
The Medical Physics Expert in Radiation Oncology is responsible for the efficiency, quality and **patient safety!**



...

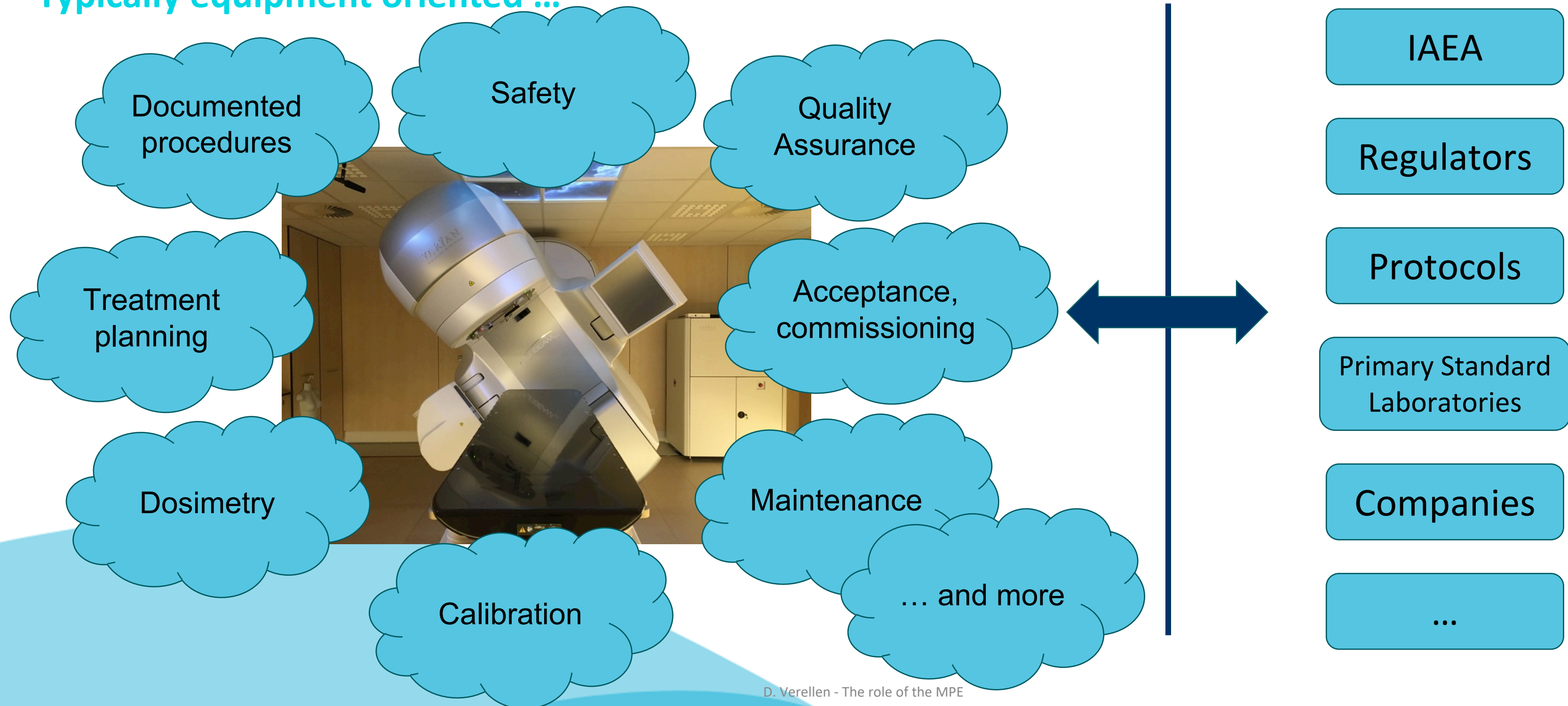
Training of the MPE in radiation oncology

A huge variation across European countries ...



The roles and responsibilities of the MPE in radiation oncology

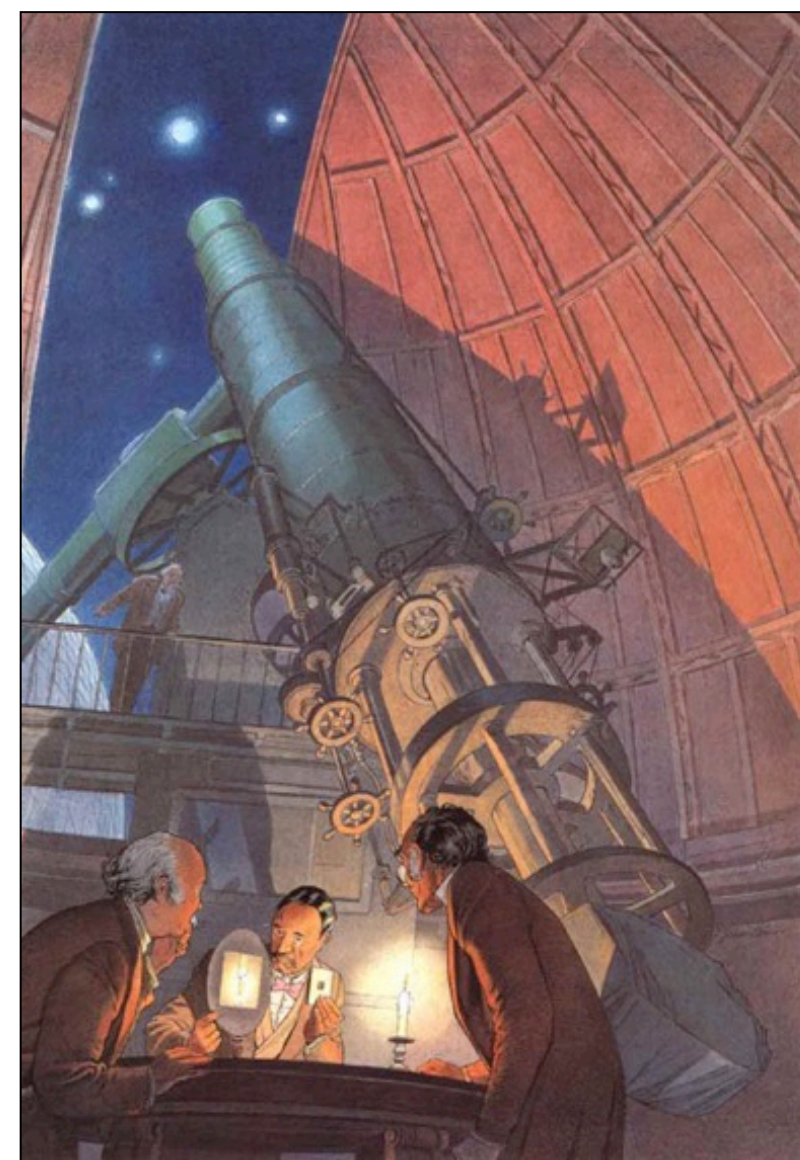
Typically equipment oriented ...



The roles and responsibilities of the MPE in radiation oncology

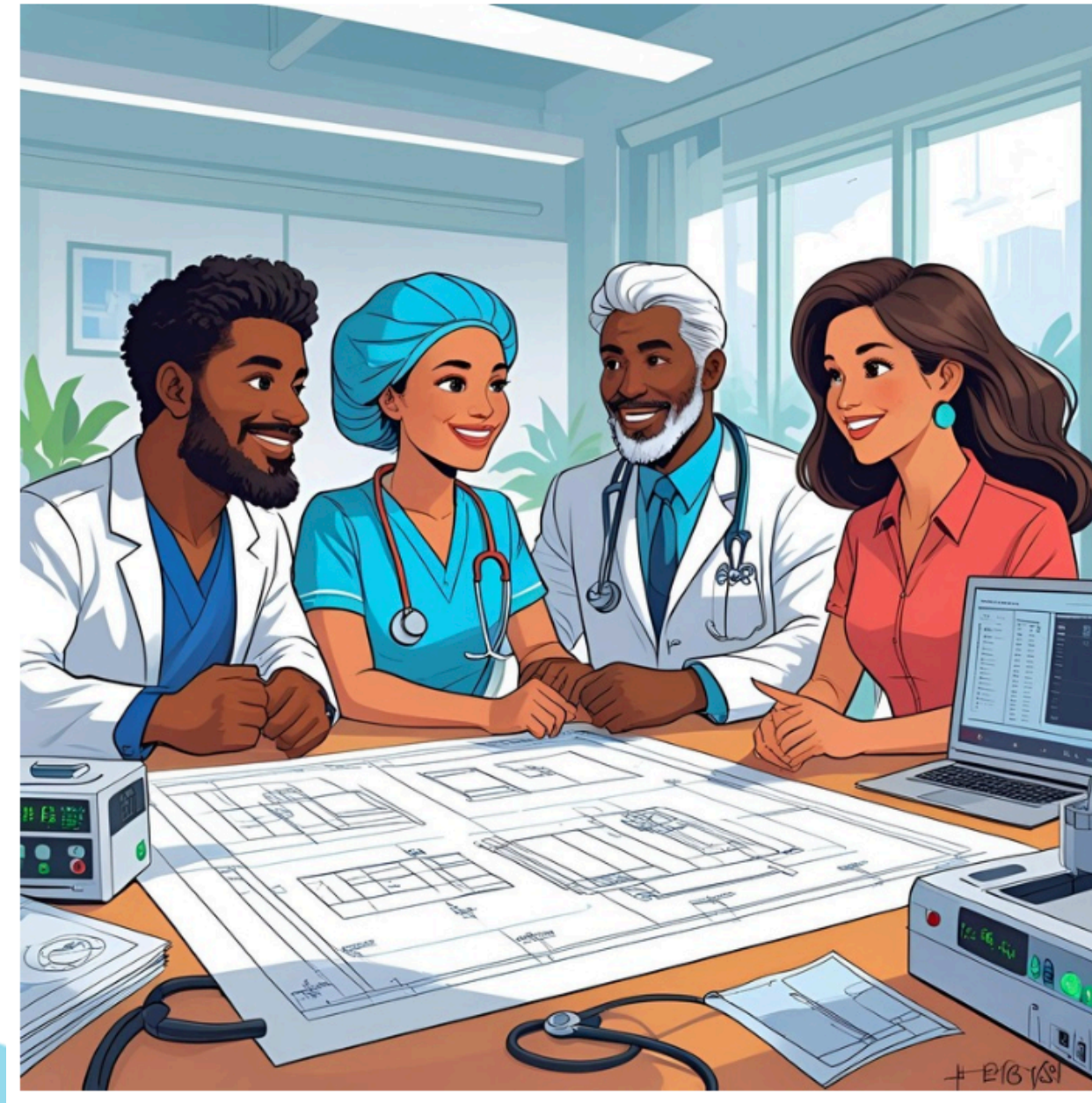
But it's much more

- Ensure technology is used for the benefit of patient
- Ensure equipment is appropriate and safe
- Technology and beyond ...:
 - Computing, scripting, and ICT issues in general
 - Prevention of accidents, pro-active risk analysis
 - Imaging: integration, QA, registration, ...
 - Margins, patient set-up and motion management (IGRT-SGRT)
 - Up to date dosimetry and QA
 - Fast and safe uptake of innovative treatments
 - IMRT / VMAT / SGRT / SBRT / SRS /UHDR /ART /...
 - Brachytherapy/intra-operative radiotherapy/ TBI / TSEB /...
 - ...
 - Training!
- The medical physics team is part of the RT-team ... no strict boundaries



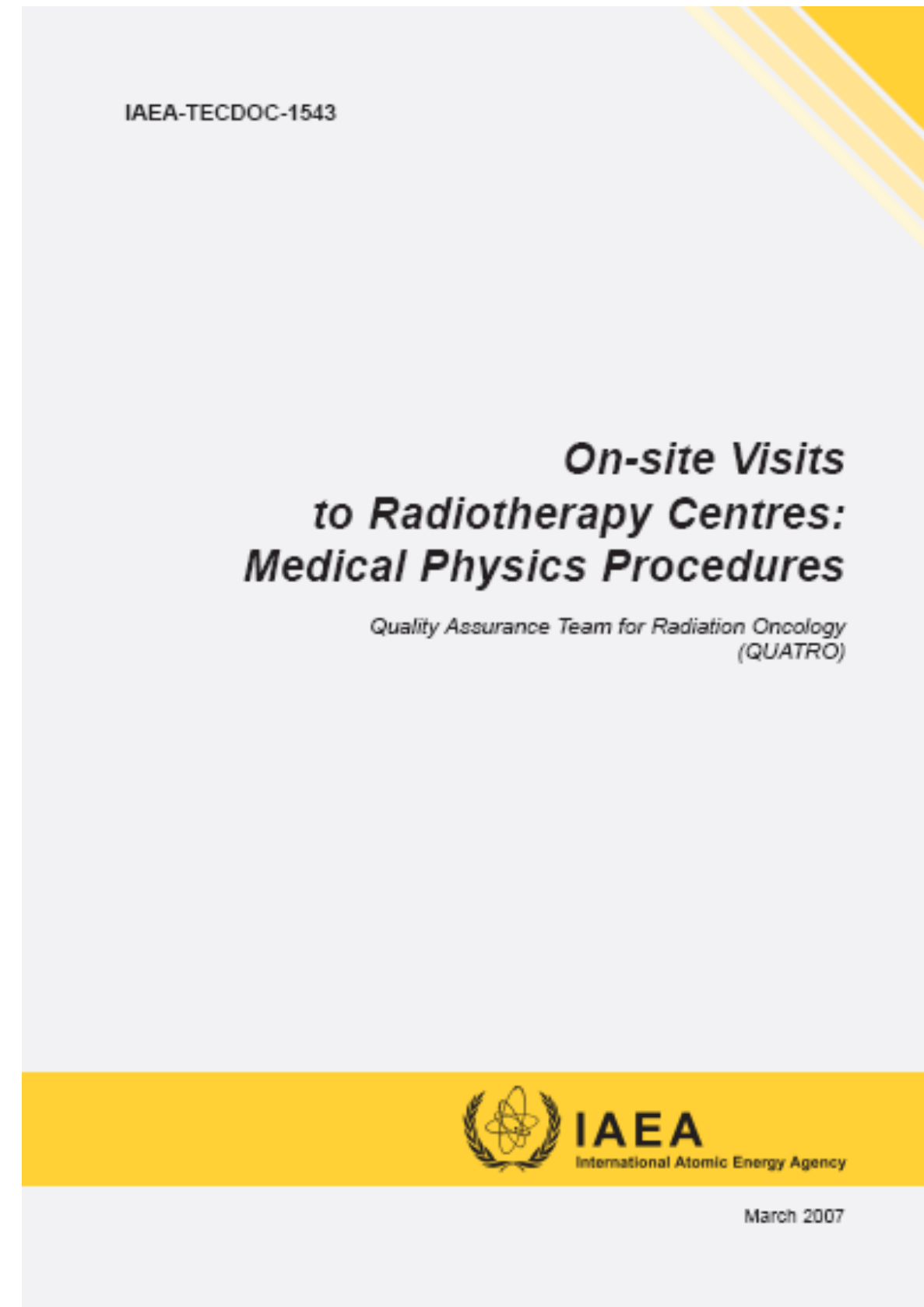
L'expérience cruciale, F. Schuiten

The role of the MPE in the audit



An interesting guide

- I TECDOC 1543
- II Physicists involvement in QUATRO
 - Patient related procedures
 - Equipment related procedures
 - Assessment of training programmes
- III Physical measurements within the program
- IV Conclusions and tie in with the team



An interesting guide

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An interesting guide

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More interesting literature



Volume 10 No 1 2010 ISSN 1473-6691 (print) ISSN 1472-3422 (online)

Journal of the ICRU

ICRU REPORT 83

Prescribing, Recording, and Reporting Photon-Beam Intensity-Modulated Radiation Therapy (IMRT)

OXFORD JOURNALS
OXFORD UNIVERSITY PRESS

Volume 14 No. 2 2014 ISSN 1473-6691 (print) ISSN 1472-3422 (online)

Journal of the ICRU

ICRU REPORT 91

Prescribing, Recording, and Reporting of Stereotactic Treatments with Small Photon Beams

OXFORD UNIVERSITY PRESS

IAEA-TECDOC-1583

Commissioning of Radiotherapy Treatment Planning Systems: Testing for Typical External Beam Treatment Techniques

Report of the Coordinated Research Project (CRP) on Development of Procedures for Quality Assurance of Dosimetry Calculations in Radiotherapy

IAEA International Atomic Energy Agency
January 2008

IAEA TRS-398

Absorbed Dose Determination in External Beam Radiotherapy: An International Code of Practice for Dosimetry based on Standards of Absorbed Dose to Water

PUBLISHED BY THE IAEA ON BEHALF OF IAEA, WHO, PAHO, AND ESTRO

ESTRO IAEA
INTERNATIONAL ATOMIC ENERGY AGENCY
21 May 2001 (V.10A)

TECHNICAL REPORTS SERIES NO. 483

Dosimetry of Small Static Fields Used in External Beam Radiotherapy

An International Code of Practice for Reference and Relative Dose Determination

Sponsored by the IAEA and AAPM

IAEA International Atomic Energy Agency

American Association of Physicists in Medicine Radiation Therapy Committee Task Group 53: Quality assurance for clinical radiotherapy treatment planning

Benedick Fraass¹, Karen Doppke², Margie Hunt³, George Starkschall⁴, Gerald Kutcher⁵, Robin Stam⁶, Jake Van Dyke⁷

Key words: treatment planning, quality assurance, 3D treatment planning

Quality assurance for image-guided radiation therapy utilizing technologies: A report of the AAPM TG-179

Jean-Pierre Bissonnette¹, Peter A. Balter and Lei Dong², Katja M. Langen³, D. Michael Lovelock⁴, Moyed Miften⁵, Douglas J. Moseley⁶, Jean Pouliot⁷, Jan-Jakob Sonke⁸, Sua Yoo⁹

Key words: quality assurance, cone-beam CT, fan-beam CT

Radiotherapy and Oncology 197 (2024) 110345

Contents lists available at ScienceDirect

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Journal homepage: www.thegreenjournal.com

Original Article

A joint ESTRO and AAPM guideline for development, clinical validation and reporting of artificial intelligence models in radiation therapy

Coen Hurkmans^{a,b}, Jean-Emmanuel Bibault^c, Kristy K. Brock^d, Wouter van Elmpt^e, Mary Feng^f, Clifton David Fuller^g, Barbara A. Jereczek-Fossa^{h,i}, Stine Korreman^{j,k}, Guillaume Landry^{l,m}, Frederic Madesta^{n,o}, Chuck Mayo^p, Alan McWilliam^q, Filipe Moura^r, Ludvig P. Muren^s, Issam El Naqa^t, Jan Seuntjens^u, Vincenzo Valentini^{v,w}, Michael Velee^x

Key words: Artificial Intelligence (AI) models in radiation therapy are being developed with increasing pace. Despite this, the radiation therapy community has not widely adopted these models in clinical practice. A cohesive guideline on how to develop, report and clinically validate AI algorithms might help bridge this gap.

Process Management and Quality Assurance for Intracranial Stereotactic Treatment

NEDERLANDSE COMMISSIE VOOR STRALINGSDOSIMETRIE

Report 25 of the Netherlands Commission on Radiation Dosimetry
October 2015

Netherlands Commission on Radiation Dosimetry
Subcommittee Cranial Stereotactic Treatments
October 2015

An interesting guide

Therefore an adequate level of QA, independent verification and quality audit are necessary for treatment planning as for other steps in the radiotherapy process. In particular, it may be noted that a similar safety philosophy of independent (redundant) checking should be applied to treatment planning calculations and processes as is recommended for all aspects of radiation treatments. Examples of these redundancies include:

- (a) Dual monitor chambers, back-up timers, independent safety and interlocking systems, etc. in equipment design;
- (b) Independent checking of beam calibration and external audit of beam dosimetry;
- (c) The use of more than one measurement technique and the comparison of the sets of results in the measurements of beam characteristics;
- (d) The comparison of input data to output at many levels in comparing the patient information in a computerised verification system;
- (e) Independent checking of patient set-up parameters by more than one radiotherapy technologist;
- (f) The use of *in vivo* dosimetry.

Practical considerations

- It is important to interpret this with the facility to be audited in mind and with due consideration of the stated objectives of the audit.
- **How is the Medical Physics Team Organized?**
 - Who are the members: MPE's, trainees, MPA's, engineers, ICT, ...?
 - How is internal communication organized (structural meetings, agenda's, minutes, ...)?
 - How are the tasks and responsibilities organized?
 - How is training organized?
 - Documentation and procedures: version management, action levels, ...
- **How is the MP-team integrated in the RT-team?**
 - Communication flows
 - Structural interdisciplinary meetings?
 - Strategic meetings?
 - Patient safety, incident reporting, pro-active risk assessment?
- **How is the MP-team connected with stakeholders outside the RT department?**
 - ICT!
 - Technical departments and maintenance
 - Manufacturers and service of equipment
 - Medical imaging and nuclear medicine departments
 - ...



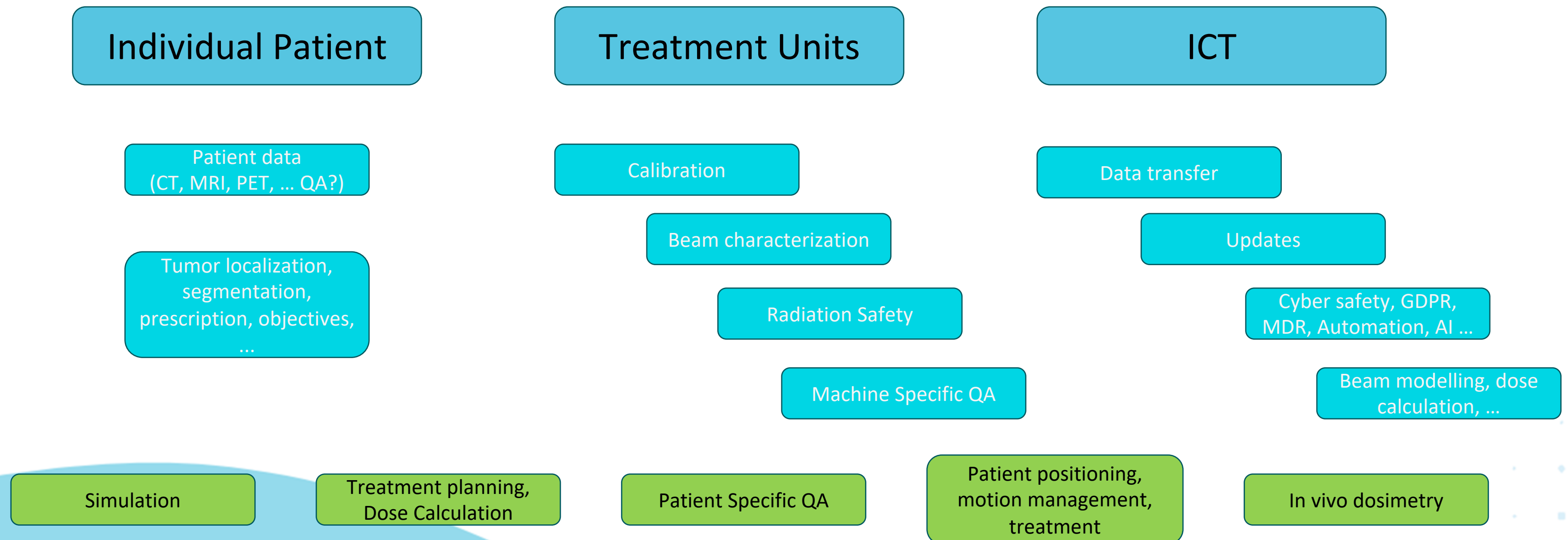
OUTSIDE



INSIDE

Practical considerations

Follow the patient's care path: where and what is the MPE's role?



Practical considerations

Observations

Equipment:

- Observe warm-up procedures
- Observe MSQA if possible
- Observe absolute dosimetry if possible
- Check QA-equipment (and QA of QA equipment)
- Verify trending, traceability, dosimetry audits, ...

Treatment planning and treatment:

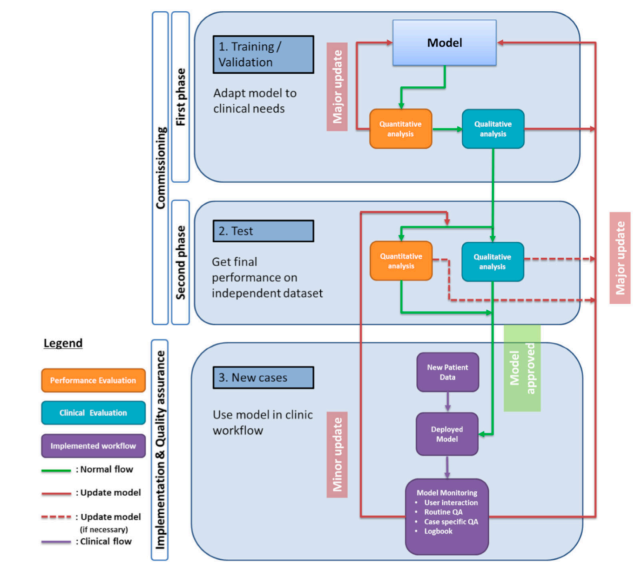
- Observe specific plans
- Verify PSQA flow (independent dose calculation, PSQA measurements, IVD: tolerances/action levels ...)
- Observe simulation and treatments

Documentation / procedures:

- Check procedures and version handling
- Check QA documentation, analysis, trending, actions
- Procedures for maintenance and breakdowns
- QA scheduling
- ...



D. Verellen - The role of the MPE



Practical considerations

Observations

- Checklists
- Review of documentation
- Discussion with local staff
- Observation of practice
- Limited measurements

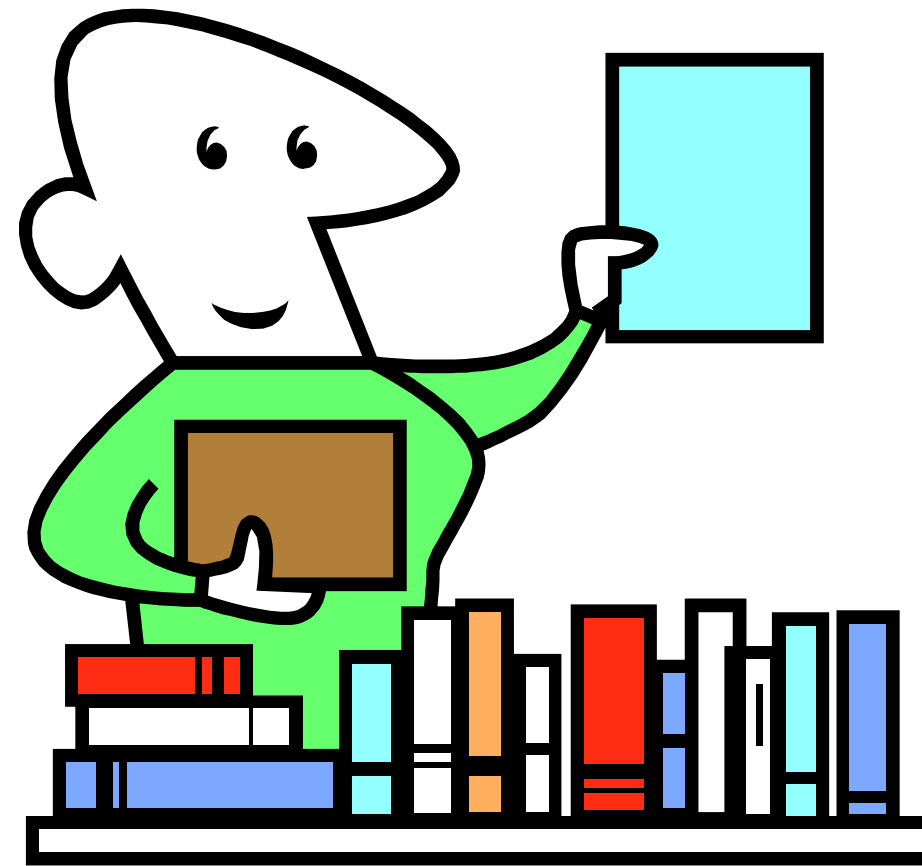
The purpose of this part of the audit is to get **an overview of the medical physics quality assurance processes, procedures, documentation and records**, as well as a sampling of the physics dosimetry data, to assess whether **all appropriate physics aspects are covered and properly implemented**.

* Dosimetry audits: see appropriate lecture

Practical considerations

Access to resources

- Library?
- Internet?
- Colleagues?
- Conferences?
- Continual education, courses?
- Internal training, Journal Clubs?



Practical considerations

Research and clinical trials

- Not just a luxury, but an obligation towards the patients
- Physicists should be included in clinical trials
- Quality assurance is essential in clinical trials
- Helps with training
- Provides motivation
(and possibly even additional resources through companies, universities, research grants, ...)
- Improves quality and innovation

Summary

- Observe
- Follow the patient's care path
- Verify if MSQA and PSQA are complementary (not redundant)
- Check communication, procedures, action levels
- Check integration/interaction (within department, with stakeholders)
- Check traceability of dosimetry, external audits, incident reporting, FMEA, E2E testing, automation/scripting/updates, ...





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