

*NSFS Conference “Current Challenges in Radiation Protection”
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Challenges in Radiation Safety from an International Perspective

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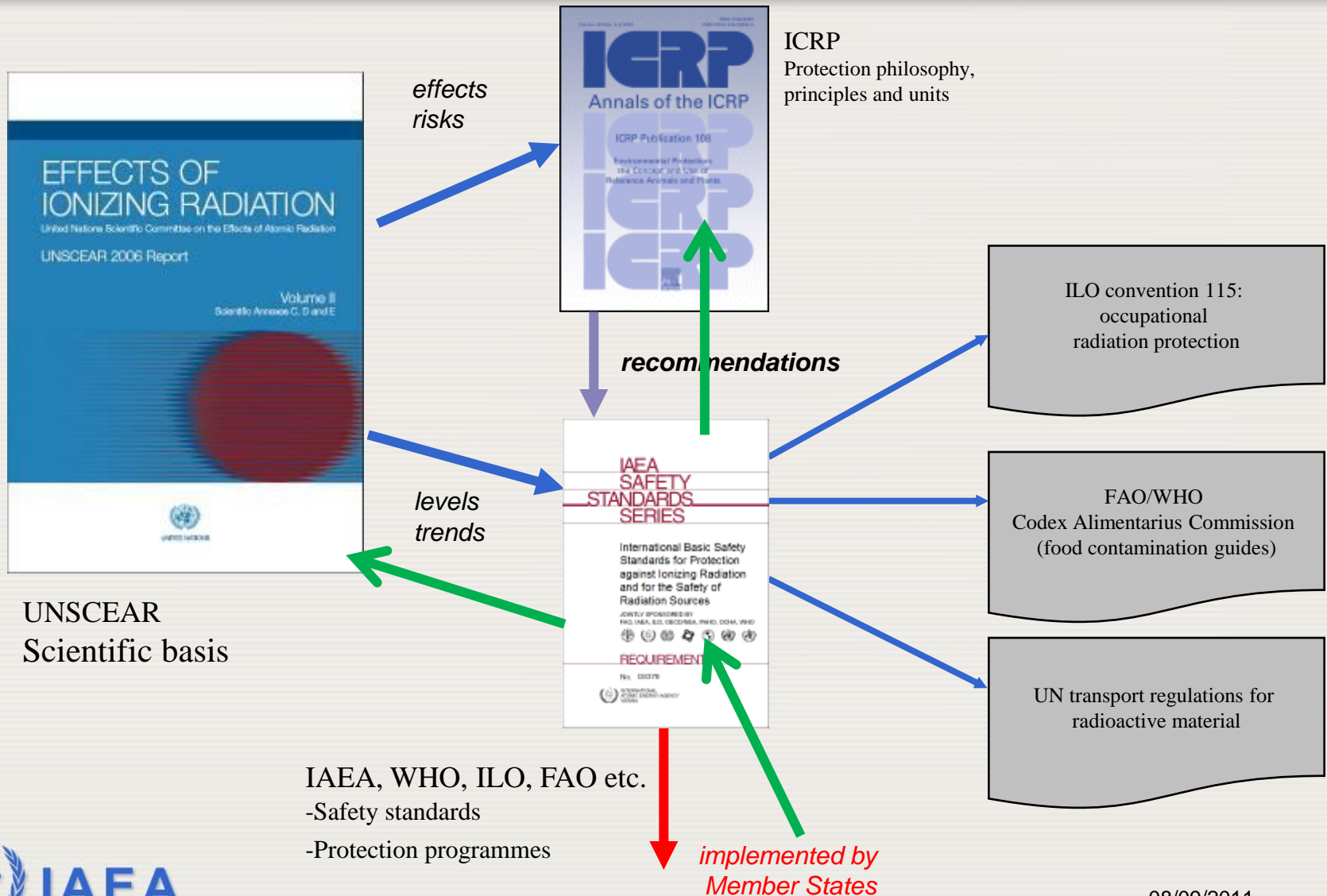
International Atomic Energy Agency

Topics

- **General aspects**
 - Radiation Protection Paradigm
 - Mandate of IAEA
 - Vision for IAEA Safety Standards
 - Influencing factors
- **Selected topical issues**
 - Medical use of ionizing radiation
 - Occupational Radiation Protection
 - Equivalent dose limits for the lens of the eyes
 - Further topical issues in summary
- **Tools**

General aspects

Radiation Protection Paradigm



General aspects

Mandate IAEA



IAEA Safety Functions (Article III.A.6)



Facilitate and service international conventions and other undertakings

“To establish or adopt... [in consultation ...] standards of safety for protection of health & minimization of danger to life and property”

“...and to provide for the application of these standards...”

General aspects

Vision for the IAEA Safety Standards

- **Complete, consistent, coherent, integrated and user-friendly safety series with a manageable number of publications**
- **Sustainable continuous improvement system through effective feedback from application of SSs**
- **Global Reference used worldwide to deliver a harmonized high level of safety for protecting people and the environment from the harmful effects of ionizing radiation**

General aspects

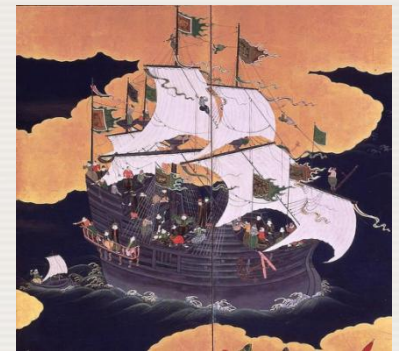
Influencing factors

Increasing globalization

- *Innovations e.g. in transport, revolution in communication, new technologies, emerging diseases, worldwide terrorism*
- *Negative impacts are increasingly being recognized*
- *RP standards not immune, have to react, increasing security countermeasures*

Challenges/opportunities:

- Enhance the harmonisation of standards and their application in trade, transport, employment and environmental protection (*eg itinerant workers, medical use of ionizing radiation*)
- Provide particular attention to LMI countries
- Recognize the important role for int. organizations



General aspects

Influencing factors ctd

Social, Political and Ethical issues

- Practicability of RP system → scientific stringency
→ in accordance with accepted ethical values
→ political and social values

Example: changes in social values during 20th century

Values focusing on individual - Values focusing on “Collectivism” (“if society is adequately protected than the individual is also adequately protected”)

In late 1990’s return of individualism ICRP 103 reflects this shift in values

Challenges/opportunities:

- Identify approaches that are better suited for the integration of new scientific knowledge and socio-political considerations in formulating radiation protection policy and standards
- Establish more accountable and transparent processes for the development of future standards

Medical use of ionizing radiation

Use of ionizing radiation in medicine

- * Indispensable for modern medical care
- * Beneficial for patients

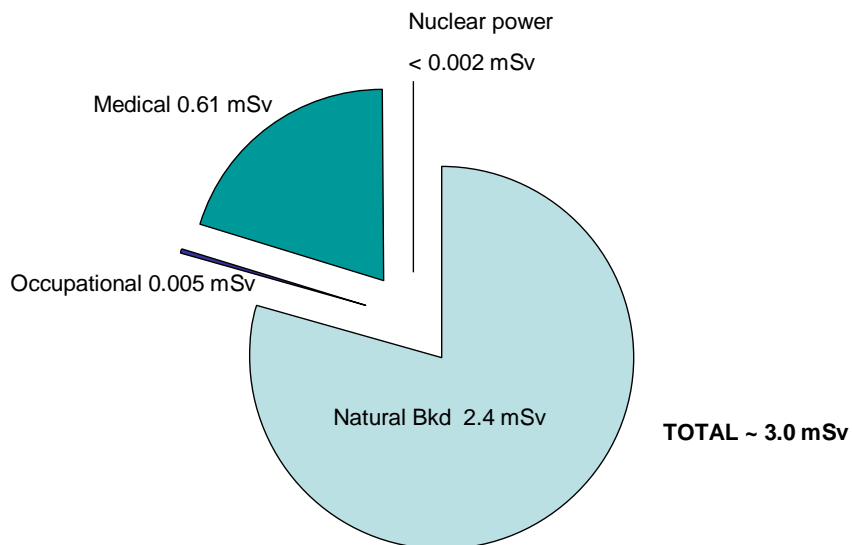
An estimated **5.1 million** courses of radiotherapy treatment were administered **annually** between 1997 and 2007 (up from an estimated 4.3 million in 1988)*

- 50-60% of cancer patients could benefit from radiation therapy
- The fraction of cancer patients treated is increasing, where RT is available



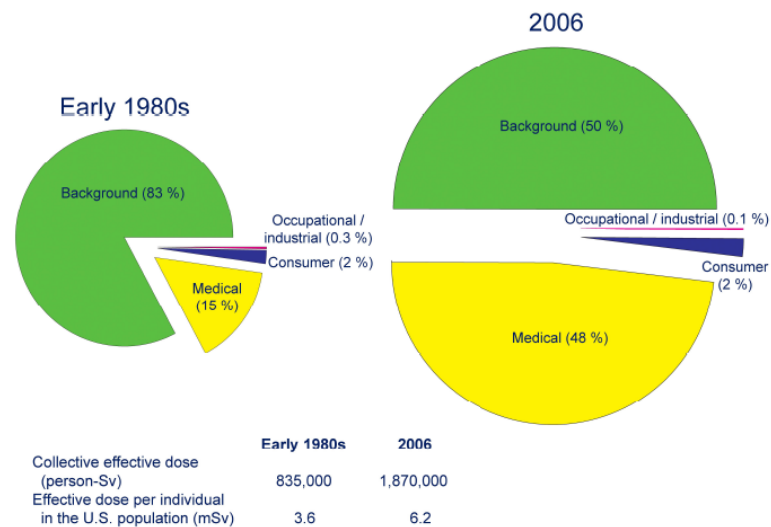
Medical use of ionizing radiation

Global development of medical exposure



Global annual per caput dose from various sources (1997-2007) UNSCEAR 2008

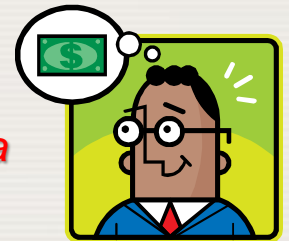
NCRP Report No. 160, Ionizing Radiation Exposure of the Population of the United States



Medical exposure is an inhomogeneous and rapidly developing activity
(globally varying access, new technologies,...)

Medical use of ionizing radiation

- Medical exposure is overwhelmingly the most significant manmade **source of exposure** to the population from ionizing radiation
 - Issues around the **optimization** of medical exposure (e.g. wide variation in doses reported for the same type of CT-scan)
 - Issues around the **justification** of medical exposure (a substantial fraction of radiological examinations may be inappropriate)

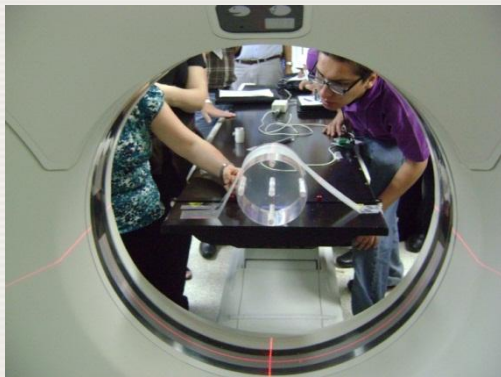


Radiologist confronted with a dilemma

Add more risk to patient

or find an alternate diagnostic approach?

(Individual risks vary from negligible to high)



Challenge/opportunity:

- Ensuring that medical procedures are justified and optimized

Medical use of ionizing radiation

Problems with Justification

- Major knowledge issues
- Evidence Issues
- Accountability Issues
- Probably Legal Issues

- How it would be viewed by society.

(The fact that everybody is doing it is not a good defence if the position is not defensible)



The Harrowing of Hell as depicted by Fra Angelico

---- and how to justify will differ ----



Medical use of ionizing radiation

Fundamental issues to be considered for improving radiation protection in medicine:

- *Human errors which will occur at a steady rate*
- *Lack of knowledge and/or experience*
- *Lack of resources, support or safety culture*
- *Self-motivated economical interest*
- *Pressure/expectations from patients.....*

Challenges/opportunities:

- Initiating and conducting R & D to achieve sub-mSv CT for all applications
- Increasing the attention to radiation protection of children
- Tracking the patient exposure
- Encouraging voluntary reporting systems
- Intensifying regulatory actions to support and encourage promotion of radiation protection

Occupational radiation protection

Specialized maintenance activities are likely to become a competitive and global business

- ➔ highly skilled workforce will become increasingly mobile
- ➔ less trained and qualified workers employed

*EC RP No 166 (2010):
around 95000 “outside” workers
(69000 in Nuclear industry)*



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Economics NewsPaper.com

HOME WORLD ECONOMICS INTERNATIONAL POLICY

“Nuclear nomads” in German nuclear power plants:
temporary workers are exposed to higher radiation
apparently

RECENTLY
RECENT CO

Occupational radiation protection

Examples (*highly skilled workforce*):

- Comprehensive risk and safety assessment (stress tests) after Fukushima accident and its follow up safety work
- Vessel head controls in maintenance



Photo: RIA Novosti

Dosimetric consequences

Optimization has an increasing importance

Challenges/opportunities:

- Ensuring proper control considering that this control will be more and more complex
- Ensuring appropriate safety culture (language, different regulations,...)

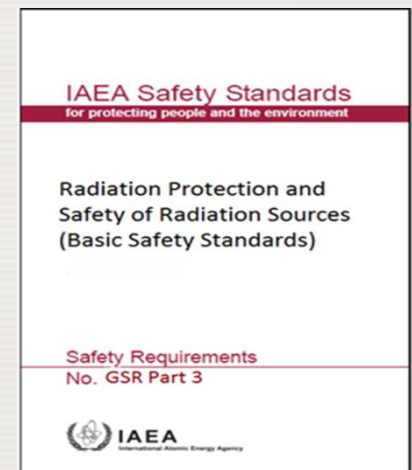
Equivalent dose limits for the lens of the eyes

Proposed and published by ICRP Main Commission in April 2011

Occupational exposure	150 mSv/a	→	20 mSv/a (<i>100 mSv in 5a</i>) (<i>50 mSv in a single year</i>)
	50 mSv/a	→	20 mSv/a (<i>apprentices and students</i>)
Public exposure	15 mSv/a	→	15 mSv/a

Challenges/opportunities:

- Ensuring an appropriate implementation into regulatory control
- Identifying proper dosimetric approaches to control the exposure of the lens of the eyes
- Evaluating the limits for the members of the public



Further topical issues in summary

- Protection of the Environment
- Emergency management and rehabilitation of contaminated sites
- Circulatory, vascular and other non-cancer effects
- Implications on dose and dose constraints when DDREF is changed
- Genetic susceptibility
- Control of radioactive sources

Challenges/opportunities:

- Integrated environmental assessment
- Epidemiological research to strengthen the evidence base
- Assessment of the implication of practical implementation
- Establish internationally agreed standards
- Utilize new management approaches (considering the global aspects)

Tools

- Enhance effectiveness of communication as essential element of safety culture
 - Modern IT solutions, social media 
 - Involvement of general public in addition to other (traditional) stakeholders
 - Transfer of new knowledge and sharing of experience e.g. on implementation of new technologies
 - Online training and certification
- Technology
 - e.g. to overcome human failure of compliance
 - Use of IT for strengthening of Safety
 - IT based approaches to achieve justification
- Networking of international organizations

Communication



IAEA

Radiation Protection of Patients (RPOP)

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Be Informed About the *Safe Use* of Ionizing Radiation in Medicine

Information to help health professionals achieve safer use of radiation in medicine for the benefit of patients

Information for
Health Professionals
Member States
Patients and Public

Additional Resources
Publications
International Standards
Training

Special Groups
Pregnant Women
Children

Member Area
Member States Area
Drafts Management Area

Actions to Protect Patients in:

- [Radiology](#) →
- [Radiotherapy](#) →
- [Nuclear Medicine](#) →
- [Interventional Fluoroscopy](#) →
- [Interventional Cardiology](#) →
- [Other Specialities & Imaging Modalities](#) →

Latest Literature

Vassileva, J., Rehani, M.,
Current issues in radiation protection in medicine, Radiat. Prot. Dosimetry (Aug. 2011)

Rehani, M.M., Vano, E., Ciraj-Bjelac, O., Kleiman, N.J.,
RADIATION AND CATARACT, Radiat. Prot. Dosimetry (Jul. 2011).

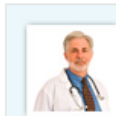
Rehani, M.M., Frush, D.P.,
PATIENT EXPOSURE TRACKING: THE IAEA SMART CARD PROJECT, Radiat. Prot. Dosimetry (Jul. 2011).

Kwon, D., Little, M.P., Miller, D.L.,
Reference air kerma and kerma-area product as estimators of peak skin dose for fluoroscopically guided interventions, Medical Physics (Jul. 2011) 38 7.

Rehani, M.M., Srimahachota, S.,
SKIN INJURIES IN INTERVENTIONAL PROCEDURES, Radiat. Prot. Dosimetry. (Jul. 2011).

[All Literature](#) ▾

Did You Know That...



...there are no TIPS available.

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Latest News

Recent publications from the IAEA projects

A number of papers have been published in journals

Accuracy of radiochromic film for dosimetry in interventional procedures

A recent paper estimates the level of accuracy in dose estimates

Progress with International BSS Basic Safety Standards

[All News](#) ▾

Upcoming Events

Medical Radiation Protection Education & Training, 21-23 April 2012

Workshop in Athens, Greece

Regional Training Course on Radiation Protection in Digital Radiology, 9-14 August 2011

Helsinki

[All Events](#) ▾



Communication

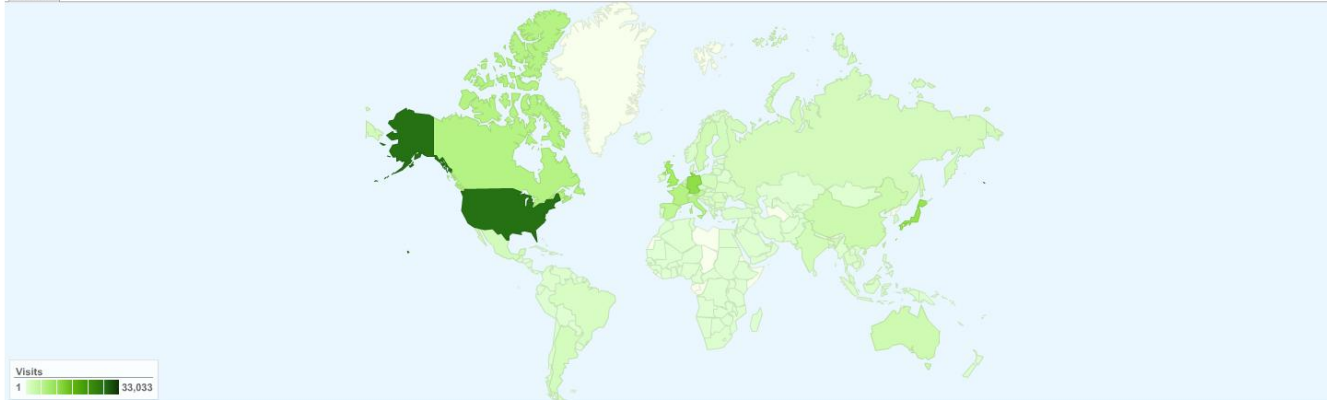
Hits on the IAEA-NS website during Fukushima accident



Map Overlay

Mar 1, 2011 - Mar 31, 2011

Visits



Visits
1 33,033

169,576 visits came from 188 countries/territories

Detail Level: City | Country/Territory | Sub Continent Region | Continent Dimension: None



Thank you for your attention



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