International Radiation Protection Association (IRPA)

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IRPA is…

**THE** international association of radiological protection practitioners, joining through national or regional Associate Societies

49 Associate Societies
62 Countries
Nearly 18,000 individual members

Enormous resource of practical knowledge and experience in radiation protection and related specialist fields
IRPA’s Vision

IRPA is recognized by its members, stakeholders and the public as the *international voice of the radiation protection profession* in the enhancement of radiation protection culture and practice worldwide.

The Principal Challenge: Making this Vision a reality
Radiation Protection in a changing society

some views

Challenges in the application of the system of protection

• society demands an holistic approach in justification and its resulting decisions – radiological risks should not be considered in isolation

• Forward-looking evaluation of risks of new technologies, techniques, practices is necessary – radiation protection is quite often behind the technical progress

Challenges regarding legal provisions of the system of protection

Challenges on how the RP professional will implement new regulation based on ICRP recommendations

How responsibly are we handling scientifically proven risks (protection) and risks which are not finally and completely scientifically proven (precaution)?

Design of the communication for the mediation of risks – public perception public understanding of radiation risk
IRPA Strategic Priorities 2012-2016 are:

- To provide an effective and focussed engagement with other international organizations based on the experience of 18000 practitioners

- To embed the sharing of good practice and professionalism in Associate Societies and individual members through the development of Guiding Principles, the support and coordination of education and training and the convening of effective Congresses

- To foster communication, the sharing of knowledge and the building of competence concerning global safety matters between and within Associate Societies

- To support young practitioners and scientists in their work in radiation protection, in their education and training, and in their efforts to become members of the radiation protection community

- To establish effective Associate Societies and associated practices, with particular emphasis on less-developed countries
Radiation Protection Strategy and Practice Committee

Objective

To lead and focus IRPA’s interactions with the principal International Organisations and the Associate Societies in order to ensure that the experience of radiation protection practitioners is effectively applied in the development of the System of Protection, and to ensure that the practitioners are informed of current issues and outcomes.

• we proposed to IRPA AS to participate through specific Task Groups

In order to

Getting feedback/learning from the profession identified on the horizon

And to participate to the discussion during the IRPA AS Forum next may in Cape Town (IRPA14)
Preliminary discussion during the next AS Forum

- Stimulate discussion in order to seek input from the IRPA AS,
- determine the views of the practitioners

There are many potential questions to be considered, and you may find it helpful to consider the following issues as well as any wider thoughts you may develop inter alia on:

- How should we present the uncertainty in risk estimates at low doses?
- Should we give a more prominent context to natural background exposure?
- Whilst accepting the principle of dose limitation, should we have more flexibility in how this is emphasized and presented? If so, how?
- Should we make ALARA even more central in our control hierarchy? If so, how do we ensure proportionality of effort?
- Should we make more effort to present radiation risk in the wider context of public health? Which ways would you propose?
Task Groups / Activities

• Implementation of the revised dose limits for the lens of the eyes
• Public understanding of radiation risks
• Security of radioactive sources
• Education and Training / Young professional network
• RP Certification and Qualification

Goal of document for IRPA 14 Congress, 2016

• Guiding Principles on Radiation Protection Culture
  Report ready for publication
IRPA initiative on RP culture

- after a 1st Report on RP Culture, a second initiative launched in collaboration with WHO and IOMP on Safety Culture in health care.

The goal: To promote safe and appropriate use of radiation in health care.

Pledge: “In our hospital we work as a team to ensure effective use of radiation and protect the patient and our staff.”
A new initiative on *Radiation Protection Culture in Medicine*

- IRPA wanted to explore the possibility of developing more practical guidance for the medical sector

- The purpose: to capture the opinion and standpoint of safety culture in medicine.

- Several regional workshops open to all countries, with a currently plan of one meeting per continent are organized and include general presentations followed by work sessions in small groups and discussion,
  - the first workshop held in Buenos Aires in April 2015,
  - The second workshop held in Geneva at WHO headquarter in Dec 2015
  - the next workshop will take place in South Africa in November 2016,
  - We have 2 Projects in discussion, one in Qatar and one in Malaysia

- Registration to the workshops is free of charge.
• 68 people attended the workshop,

Topics chosen for discussion in BA were
• the key components of radiation protection culture,
• the current perspective on RP culture in medicine in South American countries,
• and current priorities for establishing a strong culture in medicine.

Next workshop in Geneva in November 2015!
The 2nd IRPA WHO IOMP workshop in Geneva
The 4 Working Groups
Geneva WS: Framework for establishing and promoting RPCM

Chapter 1: Defining culture and terminology
- Radiation safety culture: ionizing only
- Current trends and need for actions in healthcare; trends on dose include technology and modalities
- Links with previous initiatives: BSS, IRPA Guiding Principles & Bonn Call to Action

Chapter 2: Radiation safety culture in healthcare
- Specific considerations applicable in medical settings
- Identifying stakeholders to build and maintain a RSCM or RPCM
- Challenges in RSC: May also consider specific examples of modalities

Chapter 3: Radiation Safety culture in healthcare as a part of organizational management
- International guidelines
- Roles & responsibilities
- Summary of Workshop

Chapter 4: Tools for establishing and maintaining radiation safety culture in healthcare

Chapter 5: Assessment of radiation safety culture/safety assessment in healthcare

Chapter 6: Examples of good and bad practices to foster RS culture in healthcare related to tools,
- Learning outcomes from these examples
- Different scenarios & modalities (e.g. radiology departments, interventional radiology operating rooms, teletherapy and brachytherapy services, nuclear medicine departments, dental facilities, use of radiation outside the radiology department, places where referring physicians work, medical schools, other settings/scenarios)

Chapter 7: Conclusion
Question for the ICRU

- How can understanding of radiation protection be facilitated?
- There are currently 2 units for effective dose and equivalent dose which is expressed in Sievert.
Question for the ICRU

• Numerous questions further to the epidemiological study concerning the difference in dose after acute exposure and chronic exposure. 100 mSv of acute exposure = 100 mSv of chronic exposure … 
a more complex reply than it appears …without forgetting the extent of dose rate

• But how should biological dose and its significance be approached?
- Significant drop in pro-angiogenic functional capacity of endothelial cells during acute irradiation (2.4 Gy/min) at 500 mGy compared to non-irradiated cells.

- Significant rise in pro-angiogenic functional capacity of endothelial cells during chronic irradiation (6 mGy/hour) at 500 mGy compared to non-irradiated cells.
At equal doses, the mutagenic effect varies markedly with the dose rate. When the dose rate increases, the mutation frequency after having passed through a minimum increases strongly. If the number of lesions which are present simultaneously is small, repair is generally more effective; thus it is more effective at a low dose rate than at a high dose rate. A limited number of lesions induces a reversible arrest of the cell cycle which enhances repair. A high amount of lesions prolongs the cell cycle arrest which can lead to apoptosis. A high local density of lesions reduces the repair efficacy.
The re-conceptualisation of the physical dose in Gy with another dose: the biological dose or physical-biological dose?

brief introduction:

- RBE or relative biological effectiveness has been defined by the ICRU as the ratio between reference radiation dose (Dref) and test radiation dose (Dtest) and is thus related to the concept of isoeffect.
- Within this context, absorbed dose is effectively expressed in Gray (J.Kg$^{-1}$) which is a physical variable.
the relationship between absorbed dose and the ensuing biological effect(s)

- Development of this concept of RBE demonstrates by definition relativity of the relationship between absorbed dose and the ensuing biological effect(s) (clonogenic survival, frequency of chromosome abnormality, transformation rate or others).

The physical variable is therefore not considered as an appropriate predictor of the effect in a certain number of situations when irradiation characteristics vary, such as quality of radiation and dose rate.
The question of quality of radiation - ICRP

- It has already been extensively factored into the radiation protection systems
  - based on the notion of equivalent dose and different values of the ensuing radiation weighting factor $w_r$ (ICPR 2006),
  - including accumulated analysis of the comparative test results of radiobiology (RBE) and epidemiology.

ICPR. 2006. Relative Biological Effectiveness (RBE), QualityFactor (Q), and Radiation Weighting Factor (wR). Ann ICRP [Internet]. [cited 2012 Feb 22]; 36:i–i.
Available from: http://linkinghub.elsevier.com/retrieve/pii/S0146645306000327
ICRP approach

- There is correlation between the values of $w_r$ and the physical variables describing quality of radiation (such as, linear energy transfer – LET).

- This partly illustrates the fact that 1 Gy of high-LET particles (for example, protons, alphas and neutrons) does not have the same biological effect as 1 Gy of photons, due to the very nature of the damage incurred on the micro-nanometric scale (notion of complexity of damage)
How to take into account the notion of dose rate into the RP system?

- On the other hand, the question of dose rate is far less extensively factored into the radiation protection systems.

However, it is clearly demonstrated that for the same dose (1 Gy) absorbed by the cells at 1 Gy/min or at 0.001 Gy/min, the biological effect is not the same.

This further illustrates inadequacy of the physical variable of Gy to predict biological effect.

This problem of relationship between dose rate and biological effects is particularly complex to resolve.
How to modelise?

- Temporal dimension of the relationship is really hard to model as it depends on an infinity of biological parameters (enzymatic reaction rates, cell environment, cell types, etc) rendering it complex to understand as a whole.

- On the other hand, development of a new physical-biological variable (objectivity of equivalent dose) concerning the relationship between biological effect and quality of radiation seems far easier to envisage.

- In addition, several international teams are currently working along these lines (including the European project BioQuaRT, (Lindborg et al. 2013; Palmans et al. 2014)).
question: Significance of internal dose and integration of radon

- At present the system is based on dose monitoring with the principle of the effective dose so that external dose and internal dose can be added together.
Radon

- Measurement and Reporting of Radon Exposures (ICRU Report 88) is a typically significant publication to assist the professional on how to interpret and report the results of these measurements, the associated uncertainties, and the resulting dosimetric estimates?

- The European Directive and IAEA Basic Safety Standards factor in lowering of the limits for radon. And we need to know how to do so (for example recommendations on optimal measurement strategies)?
Thanks to the IRSN team!

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