Public Health Perspectives in Radiological Protection in Challenging Topical Areas

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Overview

• Introductory historical reflections
• 3 challenging problem areas
  • Cardiovascular effects
  • Digital imaging
  • Radon
• How robust is our RP system?
• What now?... a broader scope
• RA/RM perspectives
• Awareness principle in public health
RP historically driven by a hierarchy of operational priorities

- Prevention of deterministic effects
- Focus stochastic effects of high exposures
- Care for low doses to critical groups
  - Public health: $\sum$ individuals \hspace{1cm} collective dose
  - RP Hygiene: prevention of spread of RA

ALARA
poor expert view on perception & communication

- focus on NPP accidental risk & nuclear waste
  - Acceptability based, unidirectional communication
- rational risk info may amplify outrage
  - transparency!
- no fear for 90% of IR exposure (X,Rn)
- mental construct of experts potential problem
  - Panic? Strive for conformity; beliefs; value judgements
- Patient communication in RT incidents failed
  - more Sc insight needed
Challenging problem areas for present RP

- *Surprising* cardiovascular effects of IR
  - Awareness on secondary tumours in radiotherapy
- Diagnostic imaging > 90%
- Radon paradox

A rediscovery of old new problems in RP
RP and health concern (ChAr1-CV) for cardiovascular effects

• Why has RP detected CV problems so late? RT side effect (commication!?)
  • Known since > 10 y (Hodgkin, Breast)

• Multifactorial: also chemo side effect
  • Epid. 10y survivors breast therapy (Hooning et al)

• Not only high dose problem in RT
  • Epid. Evid.Hir.Nag.& Mayak (0.3Sv protracted)
Digital imaging: (ChAr2-X)
time for action on justification and A-A-A

- >50% public IR exposure: X rays 1-3 mSv/y
- Digital resolution opportunities
  - Cost & patient dose escalation (CT)
  - High individual doses(IR): cataract, skin
  - Insufficient dose monitoring
- Core problem: Risk Awareness
- Widely spread inappropriate examinations and ineffective communication
  - IAEA-EC Int. Workshop sept. 2009 Brussels
ICRP report 85 (2001): Avoidance of Radiation Injuries from Interventional Procedures
Rn paradox in RP is (ChAr3-Rn) increasing & interest & value laden

- Lung Cancer Rn risk evidence at low dose
  - WHO 100-300 Bq/m²
  - ICRP Porto: 300 Bq/m³($D_{conv}$,factor X2) 10 mSv/y

- Uncertainties
  - $D_{eff}$ limit miners
  - Leucemia indications, thyroid

- Utilitarian ethics (exemption/clearance) for NORM industry creates LT Rn problem
  - Transgenerational ethics in urban planning
How successful was our RP system in 3 ChAr?

- **Justification (J)** poorly implemented at the responsibility levels

- **Optimisation (O)** successful in NPP’s & promising in health care

- **Limits (L)** not applied for patients/indoor
How robust is our protection paradigm?

- Stochastic/Deterministic classification questioned
  - CV, cataract, foetus

- More than DNA energy transfer
  - Bystander effects
  - Genomic instability
  - Genetic susceptibility

- Dose concept as risk indicator no longer evident
  - Environment
  - Patients

Level of abstraction?
γ-H2AX foci as biomarker for (DNA damage in) patient X-ray exposure in pediatric cardiac catheterization:

Are we underestimating radiation risks?

L. Beels, D. De Wolf, K. Bacher, J. Werbrouck & H. Thierens
UZ Gent, Belgium
American Hearth Association; http://circ.ahajournals.org

Hypersensitivity in dose range 1-50 mSv
γ-H2AX foci in T-lymphocytes could increase awareness of radiologists.

Control sample

0.5 Gy in vitro

Biomonitoring allows to visualise risk!
Challenging problems are asking broader RP system and paradigm

- Open communication & more transdisciplinarity
  - TRANS-science (Alvin Weinberg, 1972)
- Plausible underestimation of risk at low dose & high dose rate X rays
  - contribution to cancer background?
- Embarrassing new risk indications on Rn
  - economic interests (mines, NORM) vs biomarkers
  - dose conversion concept

Coherence is real challenge
Lessons learned from early warnings on 14 risk issues e.g. IR (EEA, Copenhague 2002)

Need for broader

- risk framing
- assumptions
- value judgements
  - Distributive justice
  - Egalitarian ethics
  - On individualism
- knowledge base for RA/RM

adress multi causality (J.McGlade)
From *what if?* in NEA workshop Helsinki to *what now?*

- At least more humility on what we don’t know yet
  - *Jasanov* (Harvard) in Nature
  - Misplaced certainties $\rightarrow$ Awareness

- Risk Governance
  - openness, transparency

- Ambiguities should be faced in RA
  - Normative: underlying value judgement
  - Interpretative: respect for differing expert views

- “Science should be on tap not on top” (W. Churchill)
Basic claims made for transparency in risk communication

RISCOM
K. Anderson & R. Espejo

Doing things right? Science

Truth,

Legitimacy, social

Is this right & fair?

Authenticity, integrity

No hidden agenda?
A broader RA & RM approach is needed when Risk problems are characterised by

- complexity
  - black boxes, difficult to develop clear picture
- uncertainties (data, model & science)
  - technology, hazard, exposure, risk harmful effects
- ambiguities
  - divergent values: normative or interpretative

usually interdependent
Precautionary Risk Approach

Based on:

• UN-Rio & UNESCO definitions and integrated in EU treaty and national law
• E.E.A. *Late lessons from early warnings* in review 2010

• **Strategy** for dealing with UC in an alert way, careful, reasonable, transparent and tailor made
• Associating stakeholders throughout RA process
• Considering future generations
• Goal: best possible protection human health & quality environment from range options
with RP innovations: we are on the way

- ALARA principle was precursor of PP
- **Risk awareness** is the condition for success
- Responsible Acting = Just. of practices
  - Consider alternatives (EIA)
  - Diagnostic referral guides: EC action plan
  - Good balance utilitarian & egalitarian ethics
- Optimisation of protection
  - flexible toolbox, monitoring, reference levels, culture …
- IRPA guidance ethics & stakeholder engagement.
Definition of ALARA culture
(EAN Workshop Prague, 2007)

A reference framework, a state of mind and attitude

- Allowing an individual and/or an organization to act in a responsible way in order to manage risks and give safety the priority it should have;
- Characterized by risk awareness, balanced judgement of risk and benefits, and the capability to develop and use required skills and tools for risk assessment and management;
- Realized through transdisciplinary education and training, tailored at each level;
- Supported by management commitment, guidance and supervision of competent authorities on European and national level;
- Making use of a clear definition of responsibilities.

It should have a continuous character covering all processes where RP is involved. It should have full support of authorities and professional organizations, while systematically integrated in CQI (continuous quality improvement).
To conclude: addressing problem areas with a precaution strategy means

- Involvement of relevant actors (patients)
  - Broader enriching framework for risk & value insight
  - Common good perspective instead of CT market
- Adequate transdisciplinary approaches
  - Biomonitoring opportunities
  - Communication Science: RISCOM model
  - Safety/RP culture development
  - Reconsider RP Hygiene for Rn and NORM

Priority for awareness