The System of Radiological Protection: A Medical and Public Health Perspective
Outline

- Introduction
- The system of Radiological Protection in medicine
- Areas of improvement
  - Implementation issues
  - Scientific and ethical issues
  - Dissemination potential
- Conclusion
**World Health Organization**

- **Function**: act as the UN directing and coordinating authority on international health work

- **Objective**: attainment by all peoples of the highest possible level of health

- **Definition**: "HEALTH is a state of COMPLETE physical, mental and social well-being and not merely the ABSENCE of disease or infirmity" (Constitution, 1948)
Ministries of Health (193 Member States)

Delegates from 53 of WHO's 55 original member states came to the First World Health Assembly in June 1948. They decided that WHO’s top priorities would be sanitation, women’s and children’s health, tuberculosis, venereal disease, nutrition and environmental sanitation – many of which we are still working on today. WHO's work has also grown to also cover health problems that were not even known in 1948, including relatively new diseases such as HIV/AIDS.

1948 International Classification of Diseases
WHO took over the responsibility for the International Classification of Diseases (ICD), which dates back to the 1850s and was first known as the International List of Causes of Death. The ICD is used to classify diseases and other health problems and has become the international standard used for clinical and epidemiological purposes.

1952–1964 Global polio control programme
One of the first diseases to claim WHO’s attention was polio, a crippling and disabling disease that afflicted some 50 million people in 1950. The global polio control programme, led operationally between 1952-1964, used mass vaccination with the oral polio vaccine. By 1955, the control programme had saved more than 300 million people in 10 countries and reduced global disease prevalence by more than 99%.

1967 South African surgeon Christian Barnard conducts the first heart transplant.

1974 Onchocerciasis control programme
WHO has led for 25 years to eliminate onchocerciasis – or river blindness – from West Africa. In 1995 there were 120 million who were infected and 350,000 children born from them. Thirteen years of cases have been able to reduce 25 million hectares of the disease and 150,000 children were saved from blindness. Thousands of survivors have been able to reduce 25 million hectares of the disease and 150,000 children were saved from blindness.

1979 Eradication of smallpox
The eradication of smallpox – a disease which had claimed a billion and killed millions – in the late 1980s is one of WHO’s greatest achievements. The campaign to eradicate the deadly disease throughout the world was conducted by WHO between 1967 and 1980. It is the first and so far the only time that a major infectious disease has been eradicated.

1983 Institute Pasteur (France) identifies HIV.

2004 Adoption of the Global Strategy on Diet, Physical Activity and Health.
WHO's core functions

1. Articulate **ethical and evidence-based** policy positions
2. Setting **norms and standards**, and promoting and monitoring their implementation
3. Shaping the **research agenda**, and stimulating the generation, translation and dissemination of valuable knowledge
4. Providing **technical support**, catalysing change and developing sustainable institutional capacity
5. **Monitoring** the health situation and **assessing** health trends
6. Providing leadership on matters critical to health and engaging in **partnerships** where joint action is needed
These core functions encompass Radiation Protection

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WHO Partners in Radiation Protection

International Organizations

NGOs

Collaborating Centres

National Authorities
ICRP collaboration with WHO

- ICRP in official relations with WHO since 1956
- Joint plan of work, approved by the WHO Executive Board
- Several current and recent activities (Hinari access, translation of ICRP documents, collaboration in scientific meetings, …)
The System of Radiological Protection (RP)

- **Purpose**
  - To provide an appropriate level of protection for people and the environment against the detrimental effects of radiation exposure without unduly limiting the benefits that may be associated with such exposure.

- **Source-related approach and individual-related approach**

  ![Diagram showing radiation source, exposure pathways, radiation dose, and radiation risk.]
ICRP System of Radiological Protection

- Three **principles**
  - Justification
  - Optimization
  - Limitation

- Three **categories of exposure**
  - Public
  - Occupational
  - Medical

- Three **exposure situations**
  - Planned
  - Existing
  - Emergency
Radiation in health care

- Medicine represents the largest contribution to the exposure of the population from artificial sources of IR (95%)

- Only exceeded worldwide by natural background as a source of exposure
  - Almost equal to natural background as a source of exposure to the population in US (NCRP Report 160)
  - Similar trend in other countries
Challenges in RP in health care

- To control and minimize health risks, while maximizing the benefits

- Achieving this balance is particularly challenging in medicine

- Preventing adverse effects / unintended exposures is also a big challenge
Radiological protection of patients

RP of patients has **unique considerations** that affect how the fundamental principles are applied

- The **same person** receives the **benefits** and the **risks** associated with the procedure
- The exposure is **intentional**
  - in radiotherapy, the delivery of radiation is the very purpose of the procedure
  - in medical imaging, the delivery of radiation is not the aim, but it is also intentional to obtain a diagnosis, to guide an intervention or to follow the course of a disease already diagnosed and/or treated
System of Radiological Protection in Medicine

- **Exposure situations**
  - Planned
  - Existing
  - Emergency

- **Principles**
  - Justification
  - Optimization
  - Limitation

- **Categories of exposure**
  - Medical
  - Occupational
  - Public
Justification in medicine

Applies at three levels in the use of radiation in medicine

1. Do more good than harm to the patient

2. A specified procedure with a specified objective is defined and justified to improve diagnosis or treatment

3. The application of a procedure to an individual patient should be justified
Optimization in medicine

- The dose to the patient should be managed to ensure that it is commensurate with the medical purpose.

- The goal is to use the appropriate dose to obtain the desired image or to deliver an effective therapy (not more nor less).

- Optimization is linked to justification.
Overall, the RP system is fit for purpose but …. could be improved in several areas

- Education
- Implementation
- Scientific points
- Ethical considerations
Awareness issues

- The two principles of RP for medical exposures (justification and optimization) are implicit in the concept of "First do no harm"

  "Primum non nocere"

- But in general, health professionals are not familiar with these principles and have a low awareness of radiation doses and risks

- Education and training are needed
Implementation Issues

- Complex setting
  - The health care facility encompasses all three categories of exposure (medical, occupational, public)
  - The RP system includes patients, fetus, carers, comforters and biomedical research volunteers
Implementation Issues

- Complex notions and terminologies
  - Not easy to be interpreted and implemented by health policy-makers… and even less by health care providers…

Dose limits
Dose constraints
Diagnostic reference levels
Scientific questions

- Diagnostic Reference Levels (DRLs)
  - to identify situations where the levels of patient dose or administered activity are unusually high or low
  - DRLs are often misinterpreted and/or misused…
  - Further guidance is needed for health professionals

![Graph showing number of procedures vs. dose with DRL₁ and DRL₂ indicating 75% of procedures](chart.png)
Scientific questions (cont'd)

- **Concept of effective dose in medicine**
  - Effective dose can be of practical value for comparing the relative doses related to stochastic effects
  - But *only* if the patient populations are similar with regard to age and sex

- ...is it enough?
Example: Nuclear medicine procedures

- **Breastfeeding patients:** the breastfed infant is a member of the public (limit of 1 mSv). Further guidance needed on how to proceed depending on the radionuclide & administered activity.

- **Women of reproductive age:** how long pregnancy should be avoided?
Ethical considerations

- **Example: Pregnant women**
  - **Pregnant health workers**: embryo/fetus is considered a member of the public (limit of 1 mSv)
  - **Pregnant patients**: the *risk* to the mother of not doing the procedure vs. the radiation-induced potential *harm* to the embryo/fetus
  - ICRP 103, 105, 84
  - Radiation safety and ethical issues
Potential for Dissemination

- Efforts are needed to improve the **dissemination of ICRP recommendations in the health sector**

- Messages need to be tailored for health authorities in order to facilitate the application of the system of RP in health care settings
  - *Users of radiation in health care*
  - *Referrers*
  - *Patients, public*

- Provision of ICRP publications to countries
  - Translation of ICRP documents in other languages
  - Free or discounted electronic access for developing countries
Conclusion

- The current system of RP does fit the purpose

- Improving **radiation safety culture** of medical practice is crucial to
  - ensure that patients benefit from the use of radiation in health care,
  - contribute to a more cost-effectively allocation of health resources
  - empower the health profession by encouraging an **appropriate use** of radiation

- WHO advocates the application of **ICRP** recommendations in health care settings

- This is particularly relevant to support the implementation of the International Basic Radiation Safety Standards (**BSS**)
Further opportunities

… to integrate RP in global Public Health agendas

Climate Change
  Energy Efficiency
  Indoor air pollution

Energy Policies
  Extractive industries

Health Security
Thank you...

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