Radiation effects and risk: Defining issues

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Focus on Science

Carcinogenic

Communication

What we know

• Radiation can cause cancer
• There is no threshold (Not all agree)
• Problems in how this is used
• Probability $\propto$ dose (LNT: ICRP, UNSCEAR, BEIR, IAEA......................)
• Radiation effects at level below 100 mGy to tissue
• One cannot....
• One should not.....
• One can use ......provided.......

Doctor, is a CT scan safe for my child?

Parent: Whether or not a CT scan will cause cancer in their child
• Somewhat similar question is faced by medical physicists from their clinical colleagues
• Dialogue: What if we do not do the CT scan?
Carcinogenic effects

Defining issues 1

1. Level of radiation exposure to human where effects are uncertain but there is weak but agreeable acceptance.
Defining Issues 2

2. Despite agreement between major international organizations (UNSCEAR, ICRP, IAEA...) on LNT, **what is the basis for controversy** as observed in recent years.
   - Science or communication
   - Over extrapolate

Defining Issues 3

3. To understand the results and limitations from 3 major pediatric CT scientific studies on childhood exposures published recently *(Science: Actual effects with CT)*

4. How to deal with accumulated doses from CT exposures over a period of time? *(Science)*

Defining Issues 4

5. Linear no threshold (LNT) theory may be **scientifically agreeable**

   How appropriate is it to use it for estimation of number of cancers from CT scans?
   Is it appropriate to use it for communication of risks with patients?
Possible Way Forward

• Communicating contradictory messages to public and patients versus
• Communicating with same voice to public and patients while keeping debates within the profession.
Ehsan Samei, PhD

- Fellow, AAPM
- Fellow, SPIE
- Councilor, NCRP
- Director, Ravin Advanced Imaging Labs
- Chief Physicist, Clinical Imaging Physics Group
- Professor of Radiology, Medical Physics, Biomedical Engineering, Physics, and Electrical and Computer Engineering at Duke University
- Co-founder and Faculty, Duke Medical Physics Program
- Co-founder and Past-President, Society of Directors of Academic Medical Physics Programs
- Member of number of committees of AAPM, NCRP, RSNA, SPIE
- 170 refereed publications on medical imaging development, characterization, and optimization

William Morgan

- Director of Radiation Biology and Biophysics, Pacific Northwest National Laboratory (PNNL), Richland, WA
- Chair, Comm Rad Effect (C1) ICRP
- Board of Directors NCRP
- European Community’s Non-Targeted Effects of Ionizing Radiation (NOTE)
- United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR)

Roy Shore, PhD, DrPH

- Vice Chairman and Chief of Research, Radiation Effects Research Foundation, Hiroshima, Japan
- Professor Emeritus, Dept. of Environmental Medicine, New York University School of Medicine
- Former member of ICRP and NCRP
- Member of number of committees of NAS/NRC, UNSCEAR, ICRP, WHO, NCRP
Marilyn Goske, MD

- Founder & Chair, Image Gently
- Chair for Radiology Education, Dept of Radiology, Cincinnati Children’s Hospital
- Professor of Clinical Radiology and Professor of Clinical Pediatrics at U Cincinnati.
- Past-President, Society for Pediatric Radiology.
- National advisor Image Wisely.
- Member of number of committees of ACR, AAPM, NCRP, Society of Paediatric Radiology.
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Thank You

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