

Radiation effects and risk: Defining issues

Madan M Rehani, PhD
International Atomic Energy Agency,
Vienna
madan.rehani@gmail.com

Rehani, M. Hamilton, Canada

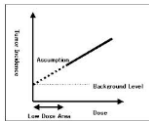
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Focus on Science

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.....)



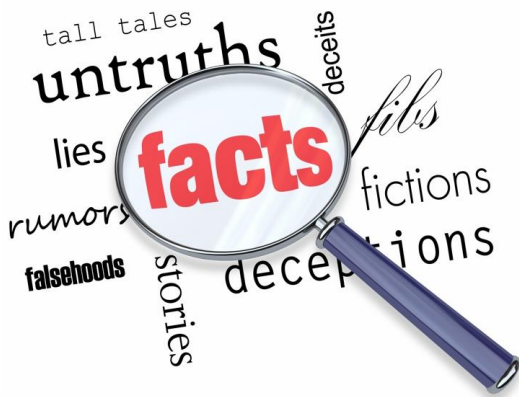
- Radiation effects at level below 100 mGy to tissue
- One cannot....
- One should not.....
- One can useprovided.....

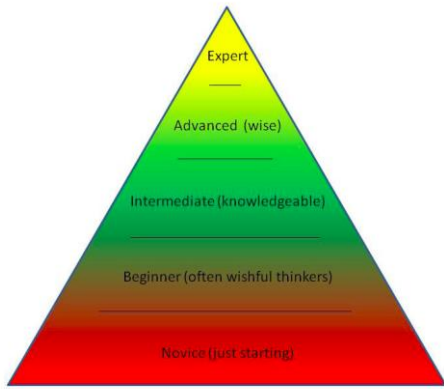


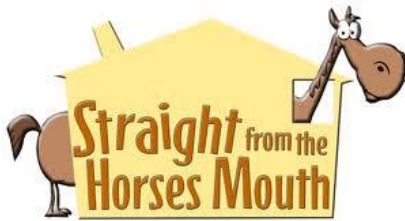
Doctor, is a CT scan safe for my child?

M J GOSKE, MD Br J Radiol. 2014 Feb;87(1034):20130517

- 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?

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
- NCI, U.S. Department of Energy's Scientific Review Group for the Russian health Studies Program, NAS Board on Radiation Effects Research
- 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.
- Consultant to the IAEA.

Thank You



madan.rehani@gmail.com
