Overview of global usage of x-rays for diagnostic purpose, issues and approaches for safety

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Educational Objectives

1. To understand the global usage of diagnostic x-rays and CT and issues and approaches for safety
2. To learn about science behind current dose effects relationship and risk estimates at the level of few CT scans and the uncertainties in estimating risks from CT scans
3. To understand how issues of CT scan risks are perceived by patients and physicians and how they can be better presented to them

UNSCEAR 2000 & 2008

(b) Contributions to collective dose

UNSCEAR 2000

(a) Contributions to frequency

(b) Contributions to collective dose

Contribution to Frequency

 UNSCEAR 2000 & 2008

Contribution to Frequency

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Contribution to Frequency
V. ASSESSMENT OF GLOBAL PRACTICE

A. Diagnostic radiology

19. The medical use of ionizing radiation remains a rapidly changing field. This is in part because of the high level of innovation by equipment supply companies [8] and the introduction of new imaging techniques such as multidetector CT and digital imaging.

20. In the UNSCEAR 2000 Report [8] it was noted that 34% of the collective dose due to medical exposures arose from CT examinations. As a consequence, the increasing trend in annual CT examination frequency and the significant dose per examination have an important impact on the overall population dose due to medical exposures. The contributions of CT examinations to the population dose has continued to increase rapidly ever since the practice was introduced in the 1970s. In the area of CT examinations, the introduction of helical and multidetector scanning has reduced scan times [8]. As a consequence, it is now possible to perform more examinations in a given time-to reduce the scope of CT examinations and procedures.

22. According to the current data, the number of diagnostic radiology examinations has increased by about 30% from 2005 to 2015. The trend for imaging in principle is a given trend. The increasing practice on the use of helical and multidetector scanning in recent years has reduced scan times [8]. As a consequence, it is now possible to perform more examinations in a given time, to extend the scope of some examinations, and to introduce new techniques and examinations. The ease of acquisition of different images could increase rapidly ever since the practice was introduced in the 1970s.
Is all use of x-rays, in particular CT APPROPRIATE?

NO  BAD

More Ugly

How to deal with this situation?

When there is inappropriate usage-
drawing attention to risks is the most pertinent

Inappropriate attention to RISK

How to deal with this situation?

- Regulatory requirements for justification: In place for nearly 2 decades,
- Appropriateness criteria: Provided for over a decade
- Clinical decision support system: Introduced about a decade ago and most data pertains to reduction in utilization and a very limited data is available on enhancing appropriateness
Medical Physicists

• Have responsibility of educating clinical and other healthcare workers on safe use of radiation and are often asked about risks involved in radiological examinations so as to balance risks with benefit as a tool to achieve appropriateness.

• Interact with experts in radiation effects to have correct picture of effects at levels used in clinical practice (Dr Brenner)
• Need to have skills to communicate risks in clinical settings in day-to-day practice. (Dr Frush)
• To have awareness on when to seek advice from other experts in fields like radiation effects, epidemiology, radiation biology and to radiation protection experts rather than crossing boundaries amidst uncertainty of information

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• Identify where uncertainty requires advocating caution
• Skill in dealing with uncertain risk situation with individual patient where the benefit is also uncertain.

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How to deal with situation?

• Rational understanding of science behind risk estimations
• Communication with patients
Questions for Dr Brenner (1)

• There is no denying that radiation can cause cancer,
• Many are not convinced that it is true at level of a CT scan or couple of CT scans.
• Is there scientific evidence to get a clear picture or is it all based on extrapolation?
• If evidence is not clear, how hazy is the picture and how to deal with the issue so as to attend to concerns.

Questions for Dr Brenner (2)

• If you are able to provide evidence that the risk at the level of couple of CT scans is real,
• Is the risk of 10th CT scan same as of first or 5th.

Questions for Dr Brenner (3)

• If the risk of 10th CT scan is same as of 1st, then why do we say that risk is additive.
• It is easy to understand additiveness of risk for tissue reaction, not sure if it is true for cancer risk.

Questions for Dr Brenner (4)

• You have earned fame (also many enemies too) in estimating cancer deaths from CT scans.
• Is this correct thing to do in backdrop of the ICRP clearly stating that “the calculation of the number of cancer deaths based on collective effective doses from trivial individual doses should be avoided”

Questions for Dr Brenner (5)

• There are many who say that your estimations are leading to scare resulting in refusal of needed CT scans and thereby doing disservice to patient. What is your take on this?
• If published evidence is lacking (?) still practitioners say that they face this situation in day-to-day life. Do you think it is better to avoid such estimations and use other methods to highlight risk.
Questions for Dr Brenner (6)

• Risks are not applicable to individual but we face this situation in daily life in hospital where questions are posed to MP are based on individual patient.
• How we can deal with individual risk without flouting ICRP’s and other organization’s advice.

Questions for Dr Frush (1)

• It is said that each examination should be clinically justified. Once justified, the benefits outweigh risks.
• So there is no place for risk and physicians should only make decision based on clinical need for the patient at hand.
• Thus it is not benefit-risk but benefit only.

Questions for Dr Frush (2)

• Is Justification (appropriateness) happening?
• Why are there reports of so many unjustified examinations?
• In many of your presentations, slide listing drivers for overuse of CT.
• It means radiologists are aware about overuse, unjustified use, understand what factors are contributing to the situation, but are helpless in controlling!!!.
• If risk estimations are creating fear, then what is the alternative solution?

Questions for Dr Frush (3)

• We all believe that children are more sensitive to radiation.
• In clinical practice how does one manage risk to an infant versus a 10 years old? A boy versus a girl?

Questions for Dr Frush (4)

• In pursuit to create a safer world for children, Image Gently has child sizing, step lightly....
• Is there strategy to monitor impact?. Has there been documentation of decrease in inappropriate CTs?

Questions for Dr Frush (5)

• How medical physicists can help you in this issue on reducing inappropriate CTs?
• How Dr Brenner’s work can help in your mission to make children safer?
• How we can work together?
• Can we have collective voice as patients are getting contradictory messages through media.
• How can we stop that happening?