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Radiation risks and family medicine

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Radiation risks

In recent years the exposure of patients to ionizing radiation (IR) for diagnostic tests has increased greatly [1]. …..

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Advanced imaging technology has opened new horizons by providing essential tools to improve patient care through earlier diagnoses and less invasive treatments. By applying these advances, the radiology practitioners have significantly improved the quality of care. However, the technological evolution and availability of new diagnostic instruments, e.g. CT, PET, scintigraphy, and interventionist radiology, has increased patients' overall exposure. While the development of modern technology is bringing new benefits and medical equipment continues to become safer, inappropriate or unskilled handling can result in potential risk for patients and staff.

Radiological diagnostics may produce stochastic effects, causing some diseases, in particular cancers, leukaemia and genetic modifications [3]. The risk of the onset of harmful effects increases with the increase in the dose of exposure, but the degree of their seriousness is independent from the absorbed dose. …

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Dose limits have not been fixed for patients undergoing diagnostic examinations and medical treatments, but the principle of 'justification' has been stated. "*Medical exposure ... shall show a sufficient net benefit, weighing the total potential diagnostic or therapeutic benefits it produces,*

including the direct health benefits to an individual and the benefits to society, against the individual detriment that the exposure might cause, taking into account the efficacy, benefits and risks of available alternative techniques having the same objective but involving no or less exposure to ionizing radiation" [4].

To better understand the differences among different diagnostic tests you have to know that a thorax X-ray examination produce an exposure of 0,02 mSv, while the exposure of a thorax CT is about 8 mSv, that is equivalent to 400 standard thorax X-rays, and is comparable to 3.6 years of natural radiation (see table I).

It was reported that as many as 20 million adult CT and more than one million paediatric CT would be unnecessarily performed in the US every year [5]. A recent editorial by Michael S. Lauer in the NEJM suggested that the professional ordering a test must consider the degree of the previous radiation exposure of the patient for diagnostic and non-diagnostic aims, at least in the last 5 years, informing the patient properly [6]. As for the patients' point of view, a recent survey carried out in Michigan has shown that, even if they are aware that the CT is a source of radiation, most of interviewed subjects were not aware of the quantity of the absorbed dose nor the related risks [7]. We could add that many doctors and health professionals are not effectively informed about the quantity of the absorbed dose of the most important test and interventional procedures. Research shows that medical professionals generally have a low awareness of radiation protection issues. Specifically, there is a widespread underestimation of doses and risks [8].

WHO's initiatives and General Practice/Family Medicine

The WHO is committed to improving knowledge concerning radiologic risks and radiation safety among health professionals, developing some tools to allow the Member States to face the problem equally and effectively. ….

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The aim of these WHO's initiatives is to limit inappropriate use of radiological tests which, from literature and data, is seen to be increasing a great deal. The WHO asks for the full cooperation of general practitioners in appropriateness and prevention of unnecessary tests.

What role can family medicine/general practice play in radiation safety?

Family doctors (general practitioners, GPs) are in a strategic position regarding prevention of radiation risks. They have a continuous relationship with patients, and are aware of the clinical history of each of them, based on clinical records, which are often computerized. Examining the European Definitions of General Practice there are many possible fields of intervention [9]. The GP is usually the first point of medical contact, he coordinates patient care, has a specific decision making process, and manages comprehensive care. GPs play an advocacy role *"protecting patients from the harm which may ensue through unnecessary screening, testing, and treatment"* and have a specific responsibility for the health of the community. Besides, in many countries, GPs are the gate keepers of the National Health Service, and prescribe all radiologic tests for outpatients.

A recent study showed that by using databases maintained by general practitioners, it is possible to obtain a good approximation of the exposure to radiation of the previous years for each patient, to support the doctor in the application of the principle of 'justification' and to allow the patient to be better informed when agreeing to X-ray investigations [10].

GPs could further improve appropriate use of diagnostic imaging by:

- sharing local guidelines with specialists and health authorities (risk management)
- assessing the individual benefit / risk balance of each patient (risk assessment)
- informing patients on general and their individual risk/benefit balance (risk communication)
- involving the patient in the decision-making process (risk sharing)

Conclusion

The national and international associations of Family Medicine/General Practice should increase their attention regarding radiation safety and advertise information and education, promote research and take part in any initiative on radiation safety. WONCA is already fully involved in this process.

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Table I. Typical effective dose from diagnostic medical exposure (source WHO) [11]

Diagnostic procedure	Typical effective dose (mSv)	Equivalent period of exposure to natural radiation (based on a worldwide average)	Equivalent number of chest X-rays
Chest X-ray (single PA film)	0.02	3 days	1
Lumbar spine	1.0	5 months	50
Abdomen or pelvis	0.7	4 months	35
CT head	2	10 months	100
CT chest	8	3.6 years	400
CT abdomen or pelvis	10	4.5 years	500
PET head	5	2.3 years	250
Intraoral (dental)	< 0.005	18 hours	0.25
Panoramic (dental)	< 0.03	4.5 days	1.5
Dentoalveolar cone beam CT	< 0.6	3 months	30
Craniofacial cone beam CT	< 1	5 months	50