

On X-Ray Hesitancy: Patients' Radiophobic Concerns Over Medical X-Rays

Mehdi Sohrabi¹ 

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I read the interesting commentary on “X-Ray Hesitancy: Patients' Radiophobic Concerns over Medical X-rays” published in “Dose-Response” focusing on lack of risks of diagnostic X-ray examinations.¹ It is commonly understood that health benefits of diagnostic medical practices are weighed versus possible health effects of low doses. In this context, in order to make more clear the present understandings of health effects of low radiation dose/rate exposures for which the linear no-threshold (LNT) model and hormesis model still require having significant consistent reproducible risk data at doses say below 100-200 mSv, some comments follow.

It should be noted that radiation doses from different X-ray diagnostic medical examinations, for example whole body CT with patient doses from 50 to 100 mGy within short fractions, can't be added directly to unfractionated lifetime natural radiation doses; as traditionally are directly summed up in order to derive a national mean annual public dose.² The recent “Joint American Nuclear Society and Health Physics Society Conference on Applicability of Radiation-Response Models to Low-Dose Protection Standards” participated by highly eminent experts, 1-3 October 2018, Pasco, Washington, USA,³ discussed over a century of “lessons learned and experiences gained” for better understanding of dose-response relationships as a basis for standards and guidelines for protecting the health of workers and public. In fact, the LNT model being the target of discussions was concluded unsupported by basic science and represents an overestimate of risks of low-dose/rate exposures.³ Also, discussions held at the conference by 3 eminent groups supporting either; LNT model with epidemiology support at high doses but extrapolated to low doses with limited statistical confidence, or hormesis model proposing hermetic benefits at low doses with no reproducible risk data, or threshold response model with no discernible risk estimates below a threshold, has had no collective and conclusive agreements on any model.³ Alternatively, in a letter to the editor of Health Physics Journal entitled “Eyes should be washed for global change in radiation protection of 21st century,”⁴ the “Sohrabi Universal Radiation Protection System (URPS) Hypothesis” was proposed and justified how URPS model bridges over and reconciles the 3 stated

models.^{5,6} The “URPS Hypothesis” is in fact based on a “Standardized Individual Dose System” (SIDS) and integrates all exposures from existing, planned and emergency exposure situations. Accordingly, all radiation workers and public no matter where they live and work in the world will have the same “risk limit” and in turn “standardized dose limits.” The “URPS Hypothesis” also considers fractionated doses in particular as regard occupational doses and medical diagnostic doses while natural background doses are highly chronic and unfractionated.^{5,6} Accordingly, example annual dose limits were set 100 mSv for workers and 5 mSv for public in which mean national natural background annual public dose and fractionation factors in particular for medical exposures were considered,^{5,6} by applying USA mean national annual public doses,³ as an example.

Also, Ramsar with ~35,997 inhabitants in ~12,153 families (2016 census) has normal background doses ~0.56 to ~1.51 mSv.y⁻¹ (mean ~0.67 mSv.y⁻¹) externally and ~2.38 to ~2.48 mSv.y⁻¹ internally from ²²²Rn exposures respectively in 2 populated areas; Katalom (population; 20,716) and Chaboksar (population; 8,228).^{7,8} Only high background radiation areas (HBRA) of Ramsar with ~1,061 inhabitants in ~374 families in different villages near 50 hot springs receive doses ~0.7 to ~131 mSv.y⁻¹ (mean ~6 mSv.y⁻¹) externally, and ~2.5 to ~72 mSv.y⁻¹ internally from ²²²Rn indoors and outdoors with public total effective doses ~3.2 to ~203 mSv.y⁻¹ (<5% receive highest dose).^{7,8} Therefore, Ramsar with a large population has no supportive

¹ Health Physics and Dosimetry Research Laboratory, Department of Energy Engineering and Physics, Amirkabir University of Technology, Tehran, Iran

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Corresponding Author:

Mehdi Sohrabi, Health Physics and Dosimetry Research Laboratory, Department of Energy Engineering and Physics, Amirkabir University of Technology, Tehran, Iran.
Email: dr_msohrabi@yahoo.com



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data for 260 mSv.y⁻¹ public effective dose and health benefits.¹

It is hoped that those possibly holding the more orthodox and traditional points of view⁴ consider the “URPS Hypothesis” in particular URPS Model science-based, standardized and user-friendly to be well understood by public and workers in order to prevent radiophobic concerns of public and possibly young workers, for a global change in radiation protection in the 21th century.

ORCID iD

Mehdi Sohrabi  <https://orcid.org/0000-0002-3922-3848>

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