

Health Physics Society

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Answer to Question # 4703 Submitted to "Ask the Experts"

Category: Medical and Dental Patient Issues — Diagnostic X Ray and CT

The following question was answered by an expert in the appropriate field:

Q

My wife has been very concerned about the number of radiological procedures she has undergone. The procedures I know she has had include about five head CT scans, three abdominal CT scans, three chest helical CT scans, 10 lung VQ scans, a thallium scan, more than five MRIs, two barium swallow exams, and a large number of chest x rays. I could not determine the actual number of chest x-ray exams, but a rough guess would be more than 30. She feels she is going to get cancer much sooner than otherwise might have been. What would you say is the "effective dose" she has received from all this? She is thinking her whole body has been exposed to 100 rem or more. Can you provide any information on latent periods?

A

I am not in favor of playing the numbers game with low doses of radiation because of the great uncertainty in the risks values. However, since you are asking for some indication of the risk involved, here goes.

Estimated effective doses for the procedures performed:

5 head CT scans = 1,000 mrem or 10 mSv
3 abdominal CT scans = 2,400 mrem or 24 mSv
3 chest helical CT scans = 1,800 mrem or 18 mSv
10 lung VQ scans = 900 mrem or 9 mSv
1 thallium scan = 3,900 mrem or 39 mSv
5 MRI scans = 0 mrem or 0 mSv
2 barium swallows = 200 mrem or 2 mSv
30 chest x rays = 300 mrem or 3 mSv
Total Estimated Effective Dose = 10.5 rem or 105 mSv

The BEIR VII¹ report indicates that "At doses less than . . . (100 mSv), statistical limitations make it difficult to evaluate cancer risk in humans." It also indicates that "1 person in 100 would be expected to develop cancer (solid cancer or leukemia) from a dose of 0.1 Sv" or 100 mSv. Therefore, a dose of 100 mSv would be expected to be capable of producing only 1 case of cancer in 100 individuals exposed. Of course, this also indicates that 99 out of 100 individuals exposed to 100 mSv would not develop cancer as a result of the radiation dose. Normally, 42 out of every 100 individuals are expected to develop cancer from other causes. That is, 42 out of 100 unexposed individuals. Thus, 100 mSv would be expected to increase this normal incidence from 42 out of 100 to 43 out of 100, or an increase of 1 % in the incidence rate. You might also want to read an information sheet, "Risk/Benefit of Medical Radiation Exposures," written by one of our medical health physics experts.

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Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII Phase 2, National Research Council of the National Academies, The National Academies Press, Washington, DC (2005). Available at: <http://www.nap.edu/catalog/11340.html>.

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