Reviewer's report

Title: Thyroid cancer risks among medical radiation workers in South Korea, 1996-2015

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Reviewer: Cari Meinhold Kithara

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In this prospective cohort study based in Korea, thyroid cancer incidence rates in medical radiation workers were compared to expected rates in the general population, compared according to different job titles and estimated thyroid dose categories, and evaluated in relation to thyroid doses using traditional dose-response models. Important strengths of the study included the estimation of thyroid dose based on objective badge readings obtained from a national dose registry, which also provided information on job title, and assessment of dose-response with thyroid cancer incidence and nearly complete follow-up for cancer incidence. This study of medical workers, with the largest number of thyroid cancer cases to date, found no evidence of an association between occupational radiation exposure and thyroid cancer risk. More generally, the results provide further confirmation of a lack of association between adulthood exposure to radiation and subsequent thyroid cancer risk.

Overall, the analysis was appropriate, and the manuscript was clear and well-written. I have mostly very minor comments and suggestions.

1. Page 3, lines 3-6: delete the word "there" and combine "over" and "diagnosis"

2. Page 6, line 35: Please elaborate on the reasons for considering the probability of apron use and apron attenuation factor in the estimation of thyroid dose. What proportion of workers have an under-apron badge?

3. Page 9, line 34-35: This should be changed to "larger elevation for men than women"

4. Page 11, line 25: "for thyroid cancer rates" should be "on thyroid cancer risk"

5. Page 12, lines 6-7: Please provide some additional clarification regarding this statement: "Third, radiation effect estimates were based on thyroid organ doses constructed from individual badge dose readings while previous studies used exposure information abstracted from records or badge dosimeter." The U.S. Radiologic Technologists Study used thyroid organ doses constructed from individual badge dose readings, and the
Chinese X-ray study used simulated badge readings based on work history characteristics.

6. Page 12, line 13: "overall figure" should perhaps be "more complete picture"

7. Table 2: None of the SIRs or RRs may be negative. Please correct.

8. Table 4: "No lagged" should be changed to "No lag" or "Not lagged"

9. All tables: some of the estimates are given with three figures beyond the decimal point, which gives the impression of much more precision than the authors are likely to have had in this study. I suggest using no more than two figures beyond the decimal point (e.g., 1.35 instead of 1.357).

10. Please explain how badge readings were considered when they were below the lower level of detection. Are a high proportion of undetectable levels likely to have biased the findings toward the null? I imagine that this is a particular problem if a large proportion of workers used a below-apron badge (see comment #2 above).

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