



Long-term strategies for thyroid health monitoring after nuclear accidents

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Presented by the IARC Scientific Secretariat

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Background

- A nuclear power plant accident may result in a release of radionuclides including radioiodine, which can be inhaled by humans, penetrate into a human body, or be ingested via contaminated foodstuffs (e.g. milk and water).
- Exposure to radioiodine can cause various adverse health effects; for example, an increase in the incidence of thyroid cancer among residents exposed to ionizing radiation during childhood or adolescence is a consequence of the Chernobyl accident.
- It is important to consider how best to protect the thyroid health of the affected populations, as part of preparedness and response to any future nuclear accident.
- IARC recognized the need for guidelines on how and whether to implement thyroid health monitoring after nuclear accidents involving release of radioiodine.
- In 2017, IARC convened an international, multidisciplinary Expert Group to develop recommendations on this subject.

Aims and Approach

Primary aims

1. To develop recommendations on thyroid health monitoring after a nuclear accident
2. To identify unmet research needs

Approach

- The Expert Group consists of 14 Experts from a variety of scientific and medical disciplines and is supported by the IARC Scientific Secretariat, 3 Specialists, and 4 Advisers.
- 2 Expert Group meetings and 1 subgroup meeting were held to synthesize the scientific evidence and develop recommendations.
- Experts reviewed the scientific evidence and the experience from past nuclear accidents and drafted the report with support from the IARC Scientific Secretariat.
- Specialists provided additional input to specific chapters, in collaboration with Experts.
- Advisers contributed to the discussions at the Expert Group meetings.

Recommendations and Supporting Evidence Base

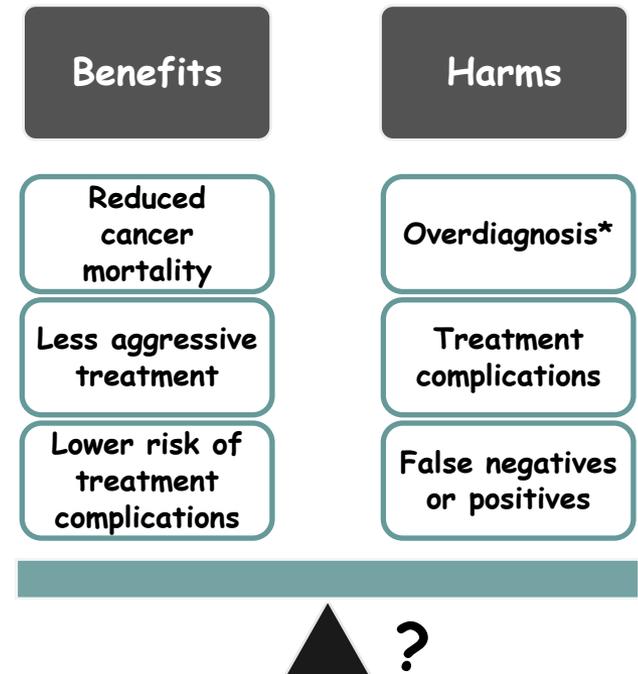
Expert Group Recommendation No. 1

The Expert Group recommends *against* population thyroid screening* after a nuclear accident.

* The Expert Group defines “population thyroid screening” as actively recruiting all residents of a defined area to participate in thyroid examinations and subsequent diagnostic or follow-up tests as indicated. A key aspect of this definition is that the starting point for the screening is at the population level; namely, recruiting all eligible subjects in a defined population irrespective of any thyroid radiation dose assessment.

Impact of Cancer Screening

- Cancer screening is the application of a screening test in an asymptomatic population to identify individuals with an abnormality suggestive of cancer, with the intent of reducing mortality and morbidity.
- The balance of benefits (e.g. reduction of morbidity or mortality) and harms (e.g. overdiagnosis*, treatment complications) of screening varies with the type of cancer, the target populations, the available resources, social values, and other factors.
- Cancer screening for some types of cancer (e.g. cancer of the cervix, colon and rectum, and breast) has been shown to reduce cancer-specific mortality.
- In contrast, for some other types of cancer (e.g. neuroblastoma), the harms of screening are deemed to outweigh the benefits.



* Detection of a cancer that would have remained asymptomatic and would not have been detected during a person's lifespan

Thyroid Cancer in Adults

- Thyroid cancer is a rare disease with in general excellent prognosis and low mortality; the expected 10-year disease-specific survival is 98–100% for localized or regional disease and 85–95% for distant metastases in patients younger than 55 years.
- Thyroid cancer screening identifies both benign thyroid nodules and thyroid cancers that will remain indolent, as well as those that will become clinically significant.
- Increased detection of subclinical thyroid cancers results in an apparent rise in thyroid cancer incidence without proportionate mortality reduction.

Screening an *asymptomatic adult population* for thyroid cancer, a disease with in general excellent prognosis, is not recommended, because *the harms outweigh the benefits*.

Thyroid Cancer in Children and Adolescents

- Thyroid cancer is less common in children and adolescents than in adults.
- In paediatrics, papillary thyroid cancer-specific 30-year survival is approximately 99–100% irrespective of sex or presence of regional lymph node metastasis at presentation, with a minimal decrease in survival (to 97%) for patients with distant metastasis.
- Similarly, for children and adolescents exposed to Chernobyl fallout, thyroid cancer-specific survival was 98–99%.

Screening *populations of children and adolescents* regardless of risk levels is expected to also result in issues related to overdiagnosis without clear public health benefits. Therefore, the Expert Group recommends against population thyroid screening after a nuclear accident.

Expert Group Recommendation No. 2

The Expert Group recommends that consideration be given to offering a long-term thyroid monitoring programme* for higher-risk individuals** after a nuclear accident.

* The Expert Group defines a “thyroid monitoring programme” as including education to improve health literacy, registration of participants, and centralized data collection from thyroid examinations and clinical management. Thyroid monitoring is an elective activity offered to higher-risk individuals**, who may choose how and whether to undergo thyroid examinations.

** The Expert Group defines “higher-risk individuals” as individuals exposed in utero or during childhood or adolescence (younger than 19 years) with a thyroid dose of 100–500 mGy or more.

Potential Benefits and Harms in High-Risk Groups

Thyroid cancer in high-risk groups:

- For example, in individuals with certain familial syndromes (high risk of thyroid cancer), thyroid ultrasonography screening is associated with detection of smaller tumours and a lower rate of central neck lymph node metastasis, requiring less extensive treatment.
- However, the evidence is currently lacking on the benefit of early detection in a high-risk group of children and adolescents, such as those whose thyroids were exposed to radiation during their cancer treatment.

Thyroid cancer after the Chernobyl accident:

- Radiation-induced thyroid cancer appears to have a similar favourable prognosis as sporadic thyroid cancer in children and adolescents, even when the disease is advanced.
- Treatment might have been less extensive if the thyroid cancer had been detected earlier.
- However, it cannot be predicted with certainty which cancers will progress to an advanced state.
- Therefore, there will still be the risk of undergoing treatment without potential clinical benefit for cancers that may have remained indolent.

Thyroid Monitoring of Higher-Risk Individuals

- It is currently unknown whether thyroid screening has more benefits than harms in terms of morbidity, mortality, and quality of life in higher-risk child and adolescent populations.
- Given this uncertainty, the Expert Group recommends that consideration be given to offering a long-term thyroid monitoring programme for higher-risk individuals (*not* population thyroid screening) after a nuclear accident.
- A thyroid monitoring programme is distinct from population screening, with the starting point being the individual instead of the population.
- Thyroid monitoring is an elective activity, and the decision about whether to participate in a thyroid monitoring programme is individual preference-sensitive.
- There has to be a shared decision-making process where the potential benefits and harms of examining the thyroid are discussed to optimize decision-making consistent with the person's values, preferences, and context.

Remarks

- The practical definition of a thyroid dose of 100–500 mGy as an actionable level for offering inclusion in the long-term thyroid monitoring programme should not be confused with radiation protection limits.
 - By choosing a lower actionable level, the programme can be more inclusive. By choosing a higher actionable level, the programme can be more efficient in monitoring and identifying radiation-associated thyroid disease in higher-risk individuals.
- This does not mean that nothing should be offered to an individual with a thyroid dose below the actionable level.
 - Some low-risk individuals with fears about thyroid cancer might seek reassurance. Low-risk individuals who wish to have their thyroids examined after being informed about the potential benefits and harms of thyroid monitoring should also be included in the programme.
- Further research is needed, and the optimal actionable level may need to be revised as new evidence emerges.

Considerations

It is important to also consider the following measures when making decisions about or preparing for the thyroid health monitoring programme after a nuclear accident:

1. Availability of monitoring infrastructure to assess the likely health consequences of release of any toxic (including radioactive) substances
2. Dosimetric monitoring in case of a radiological or nuclear accident involving release of radioiodine
3. Oral administration of potassium iodide (thyroid blocking) given to minimize uptake of radioiodine by the thyroid
4. Education/risk communication to the population living in the vicinity of a nuclear power plant

Other considerations may also be important, such as socioeconomic implications, health-care resources, and social values. The final decision should be made jointly by the government, the relevant authorities, and the society affected by the nuclear accident.

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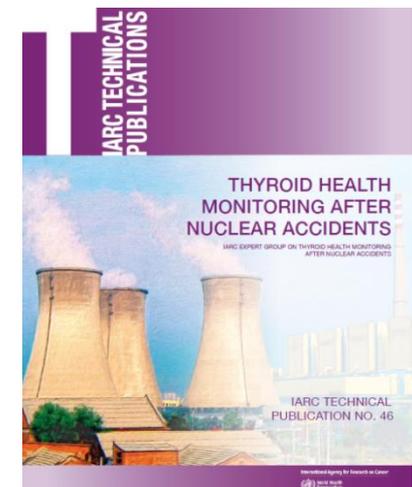
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