INTERNATIONAL STANDARD

ISO 18310-2

First edition
2021-05

Measurement and prediction of the ambient dose equivalent from patients receiving iodine 131 administration after thyroid ablation —

Part 2: External effective dose of the caregivers after release from the hospital

Mesurage et prévision de l'équivalent de dose ambiant de patients bénéficiant d'un traitement par iode 131 après ablation de la thyroïde —

Partie 2: Dose externe efficace des proches après sortie d'hospitalisation

Reference number
ISO 18310-2:2021(E)

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Published in Switzerland

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Foreword

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This document was prepared by Technical Committee ISO/TC 85, *Nuclear energy, nuclear technologies, and radiological protection*, Subcommittee SC 2, *Radiological protection*.

A list of all the parts in the ISO 18310 series can be found on the ISO website

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

ISO 18310 series addresses methods and procedures for measuring ambient dose equivalent from patients administered ^{131}I for thyroid cancer therapy.

Thyroid cancer can be treated by administering radioiodine with the remnants after surgery, because radioiodine selectively accumulates in thyroid tissue to irradiate and kill the cancerous cells. Thyroid cancers are small and are not likely to develop into aggressive malignancies. Earlier diagnosis and treatment can remove these cancers at a time when they are not likely to have spread beyond the thyroid gland.

There are two common practices for the treatment of thyroid cancer: One is a radioiodine administration without thyroid resection. The other is administration after thyroid resection. In recent years, the radioiodine administration after surgery has become more common as radioiodine selectively accumulates in thyroid tissue to irradiate and kill the cancerous cells.

The most commonly used radionuclide for the treatment is ^{131}I. ^{131}I is a radioisotope that emits gamma rays following beta decay. The primary emissions of ^{131}I decay are thus electrons with a maximal energy of 606 keV (89 % abundance, others 248 keV – 807 keV) and 364 keV gamma rays (81 % abundance, others 723 keV). Since the abundance of 364 keV gamma-ray is much greater than other gamma-ray energies, the main contribution to the ambient dose equivalent is from 364 keV gamma-ray. Its radiological half-life is 8,02 d. The iodine is administered orally and is absorbed in the gastrointestinal tract. Most iodine subsequently travels through the blood and is available in the circulation for uptake by the thyroid gland and urinary excretion; the remainder is excreted in faeces, sweat, saliva and breast milk in organic form.[1] For patients who have had their thyroid removed, the retention time in the body is shorter than that of patients who have not had their thyroid removed.

Patients who receive radioiodine treatment for thyroid cancer emit radiation and represent a potential hazard to other individuals. Critical groups among the public are fellow travellers on the patient's trip back home from the hospital, members of the patient's family, close friends, caregivers and comforters.

For the purpose of the ISO 18310 series, this document focus on the determination of the effective dose to the caregiver in the vicinity of the patient treated with radioiodine. It is based on the estimation of the effective dose using a personal dosimeter worn by the caregiver. The uncertainty of the effective dose is also provided.

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1 Scope

This document addresses the measurement methods, procedures and uncertainty estimation for the measurement, using a personal dosimeter, of the effective dose to the caregiver in the vicinity of the patient treated with radioiodine to ablate the thyroid.

The general requirements for the patient and caregiver and a guidance (see Annex A) for designated expert on instructing caregivers of discharged patients is considered to effectively measure the effective dose to the caregiver in the vicinity of the patient.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4037-1, *Radiological protection — X and gamma reference radiation for calibrating dosemeters and doserate meters and for determining their response as a function of photon energy — Part 1: Radiation characteristics and production methods*

ISO 4037-2, *Radiological protection — X and gamma reference radiation for calibrating dosemeters and doserate meters and for determining their response as a function of photon energy — Part 2: Dosimetry for radiation protection over the energy ranges from 8 keV to 1,3 MeV and 4 MeV to 9 MeV*

ISO 4037-3, *Radiological protection — X and gamma reference radiation for calibrating dosemeters and doserate meters and for determining their response as a function of photon energy — Part 3: Calibration of area and personal dosemeters and the measurement of their response as a function of energy and angle of incidence*

ISO 4037-4, *Radiological protection — X and gamma reference radiation for calibrating dosemeters and doserate meters and for determining their response as a function of photon energy — Part 4: Calibration of area and personal dosemeters in low energy X reference radiation fields*

ISO 18310-1, *Measurement and prediction of the ambient dose equivalent from patients receiving iodine 131 administration after thyroid ablation — Part 1: During the hospitalization*

ISO 29661, *Reference radiation fields for radiation protection — Definitions and fundamental concepts*

ISO/IEC Guide 99, *International vocabulary of metrology — Basic and general concepts and associated terms (VIM)*