

# ENSURING THE SAFETY AND ACCURACY OF RADIATION MEDICINE

## *The Role of Medical Physicists*

A physicist prepares a head phantom, which is a model of a head, for output measurements from a diagnostic imaging machine.

(Photo: D. Calma/IAEA)



**I**n nuclear medicine and radiology, what are the risks of carrying out a procedure without the presence of a qualified medical physicist and without adequate guidelines?

- The patient may receive an incorrect dose which can jeopardize the success of the medical treatment or the quality of diagnosis;
- The medical staff and the public might be in danger of radiation exposure;
- In extreme cases, the procedure could lead to a serious accident.

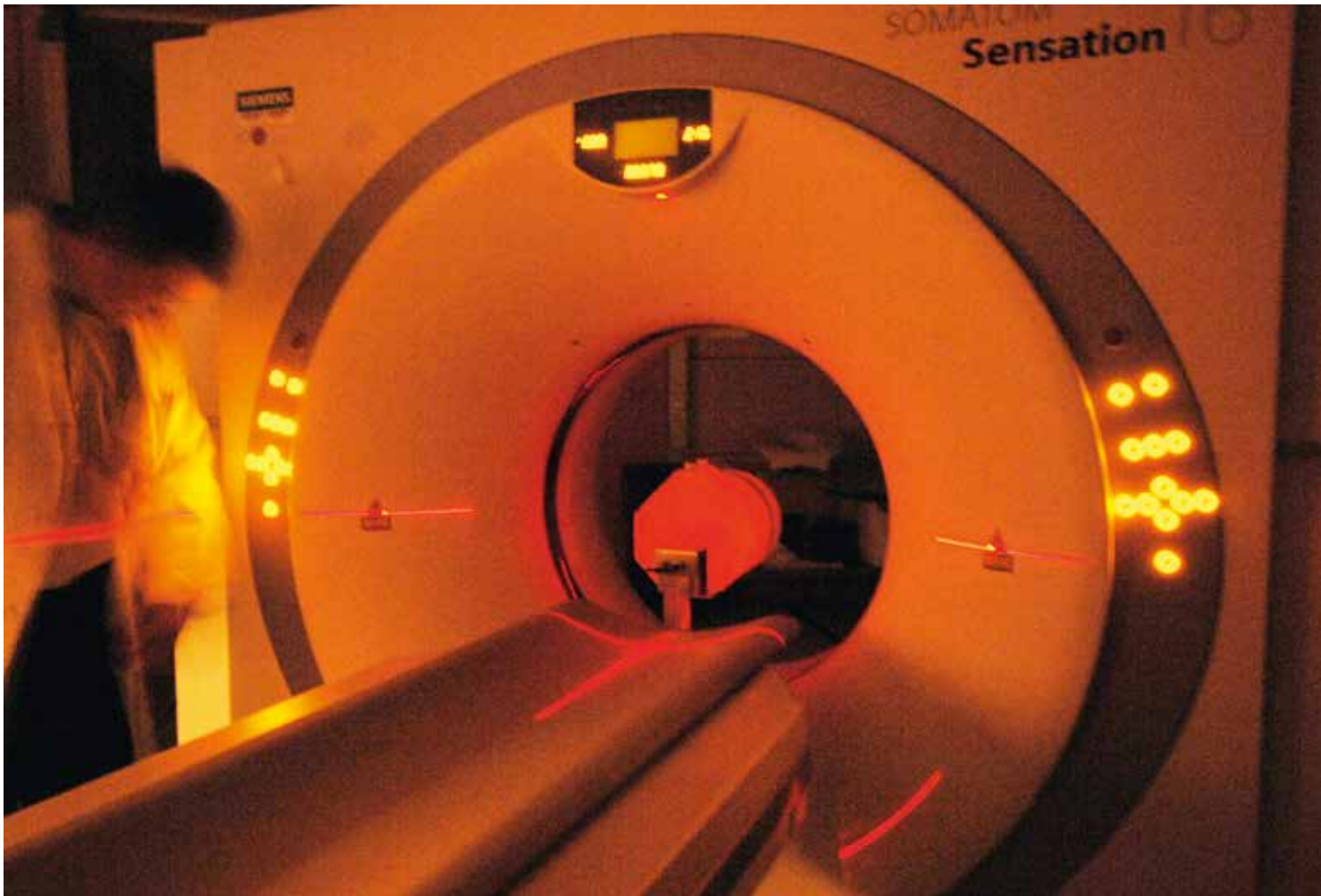
Globally, over 10 000 hospitals use radioisotopes in medicine, with almost 90 per cent for diagnostic procedures. Nuclear medicine technologies, both for treatment and diagnostic imaging for diseases such as cancer or cardiovascular diseases, are being constantly developed and deployed globally in health care systems.

Imaging procedures, such as hybrid imaging with positron emission tomography/computed tomography (PET/CT) which is a combination of technologies from nuclear medicine and radiology, allow better detection and staging of diseases by displaying functional and

anatomical information, facilitating accurate diagnosis and swift treatment. However, the use of radiation in imaging and treatment can only be optimized and made effective if health care systems have skilled professionals who possess the knowledge and expertise to ensure that applications of radiation for medical purposes is effective and safe, with no potential overexposure.

This is exactly the role of medical physicists. Medical physicists are health professionals with specialized education and training in the concepts and techniques of applying physics in medicine while ensuring that radiation protection procedures are rigorously followed during diagnosis and treatment. At the same time, they ensure the accurate use of specific tools and specialized instrumentation in all disciplines of radiation medicine. They are part of a multidisciplinary team involved in the diagnosis and treatment of patients with ionizing and non-ionizing radiation, and contribute to ensure a high standard of quality of service in hospitals and clinics.

Medical physicists play a vital role in health care systems. In addition to the core tasks related



to patient care, they also undertake critical tasks related to technical procedures which contribute to patient and staff safety, and also to the cost-effective operation of a radiation facility. These procedures include:

- Defining the technical specifications of new equipment to reflect a facility's clinical requirements and ensure that the newly installed equipment operates as specified throughout its expected life;
- Ensuring compliance with regulatory requirements;
- Developing and establishing quality management systems on the use of radiation sources for medical treatment and applying specialized tools for quality control;
- Collaborating with other clinical professionals for the commissioning and supervision of the implementation of new or complex clinical procedures;
- Training the staff associated with radiation protection issues to ensure that safe and correct procedures are performed.

Medical physicists play a significant role in the mandate that arises from Article II of the IAEA's Statute: "The Agency shall seek to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world." The IAEA has a long history of supporting medical physics both indirectly, through the publication of guidance documents, and directly, through its technical cooperation programme, which creates awareness and supports capacity building related to medical physics in Member States.

The application of ionizing radiation for medical purposes has been well established and justified for decades, but it does involve risks. With the patient being the central point of any medical diagnosis and treatment procedure, the safe and efficient use of radiation requires trained medical professionals, such as medical physicists, in order to provide swift diagnosis and treatment, and to contribute effectively to a country's health care system.

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Aabha Dixit, IAEA Office of Public Information and Communication

A head phantom, which is a model of a head, is used by physicists to align the gantry of a diagnostic scanning machine.

(Photo: D. Calma/IAEA)