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# Human Health

## **Objective**

*To enhance capabilities in Member States to address needs related to the prevention, diagnosis and treatment of health problems through the development and application of nuclear and related techniques within a quality assurance framework.*

## **International Conference on Integrated Medical Imaging in Cardiovascular Diseases (IMIC 2016)**

The World Health Organization (WHO) estimates that, by 2030, 23.6 million people will die each year from cardiovascular diseases (CVDs). Low and middle income countries face the highest burden, with more than 75% of all CVD deaths occurring in these countries. Advances in medical imaging have revolutionized health care in recent decades, providing valuable information on diagnosis, prognosis, risk assessment and therapy assessment of many diseases, including CVDs.

In 2016, the Agency continued to work with key global players — including professional organizations, health institutions and WHO — to improve the management of CVDs through medical imaging. In October, the Agency organized the International Conference on Integrated Medical Imaging in Cardiovascular Diseases (IMIC 2016), attended by 350 participants from 94 Member States. Held at the Agency's Headquarters, the conference provided clinicians, scientists and other professionals with an opportunity to review and exchange insights on the latest developments in various aspects of integrated medical imaging as applied to CVDs. Participants also discussed future trends in medical imaging as applied to the management of patients with CVDs.

## **United Nations Joint Global Programme on Cervical Cancer Prevention and Control**

In 2012, 266 000 women died of cervical cancer worldwide; 90% of these deaths were in low and middle income countries. Most such deaths could be avoided if all adolescent girls were immunized against the human papillomavirus, and if cervical screening and treatment of precancerous lesions were available to all women. Even more advanced cases of cervical cancer have a high rate of curability when treated with radiotherapy combined with chemotherapy.

The Agency has joined six United Nations agencies in a five year Joint Global Programme on Cervical Cancer Prevention and Control under the United Nations Interagency Task Force on the Prevention and Control of Non-communicable Diseases. The Joint Global Programme aims at reducing cervical cancer mortality in participating

countries by 25% by 2025. The Agency will play a pivotal role in this new endeavour by providing technical expertise in radiation medicine. The programme will work with global and national partners, initially in six low and middle income countries, to ensure that each participating country has a functioning, sustainable, high quality national cervical cancer control programme in place at the end of the five years. In November, the Agency participated in the first inception mission to Morocco organized under this programme.

## Quality Assurance and Metrology in Radiation Medicine

To provide an internationally consistent framework for the management of uncertainties throughout the radiotherapy process, the Agency collaborated with the American Association of Physicists in Medicine, the American Society for Radiation Oncology, the European Federation of Organisations for Medical Physics and the European Society for Radiotherapy and Oncology on a publication entitled *Accuracy Requirements and Uncertainties in Radiotherapy* (IAEA Human Health Series No. 31). The report, published in 2016, provides a description of the entire radiotherapy process, addressing accuracy issues from radiobiological, clinical, dosimetric and technical perspectives, and discusses the management of uncertainties.

During the year, the Agency organized several training activities for clinical medical physicists, on a national, regional and interregional basis. This included a Joint ICTP–IAEA Workshop on Internal Dosimetry for Medical Physicists Specializing in Nuclear Medicine, held in Trieste, Italy, in November with the support of the International Centre for Theoretical Physics. The workshop, supported by the American Association of Physicists in Medicine and the European Federation of Organisations for Medical Physics, provided participants with a comprehensive review of the basics and recent developments in the fields of nuclear medicine image quantification and internal dosimetry. It was attended by 38 participants from 24 Member States.

The Agency organized a second train the trainer workshop on medical physics support for nuclear or radiological emergencies, held in Atlanta, United States of America, in May, in cooperation with the Argonne National Laboratory. The workshop was designed to provide participants with a good understanding of their potential roles in nuclear or radiological emergency situations, and to prepare them to contribute effectively to the response, as identified in emergency preparedness plans. The workshop, attended by 19 participants from 17 Member States, was hosted by the Centers for Disease Control and Prevention and supported by the Radiation Emergency Assistance Center/Training Site and the Emory University School of Medicine (Fig. 1).

The Agency provides dosimetry calibrations, comparisons and audits to secondary standards dosimetry laboratories (SSDLs) and audits to radiotherapy centres worldwide. In 2016, it performed calibrations of national dosimetry standards for 22 SSDLs and conducted 12 bilateral comparisons. Since the beginning of this activity, the Agency's auditing services have checked over 12 000 radiotherapy beam calibrations in 132 countries. In 2016, over 600 hospital beam audits were completed, with 21 repeat checks to follow up discrepancies that otherwise might not have been discovered, which could have led to incorrect treatment.

A high dose rate brachytherapy unit was commissioned in 2016. The unit will be used for dosimetry calibrations for SSDLs, contributing to increased consistency in

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FIG. 1. Simulation of medical management of patients at the train the trainer workshop on medical physics support for nuclear or radiological emergencies, held in Atlanta, United States of America, in May.

brachytherapy dosimetry internationally.

In November, a Regional Training Course on Protection Level Calibrations Performed at Secondary Standards Dosimetry Laboratories, with 20 participants from the Co-operative Agreement for Arab States in Asia for Research, Development and Training related to Nuclear Science and Technology (ARASIA), was held at the Agency's

Dosimetry Laboratory (Fig. 2). Participants brought their dosimetry instruments to compare their measurements with the Agency's reference standards.



FIG. 2. Calibration setup during a Regional Training Course on Protection Level Calibrations Performed at Secondary Standards Dosimetry Laboratories held at the Agency's Dosimetry Laboratory, in Seibersdorf, Austria, in November.

## Assessing Dietary Intake and Energy Expenditure in Low Resource Settings

Comprehensive, reliable data on individual dietary intake and energy expenditure are extremely important for establishing recommendations for optimal nutrition and for designing nutrition policies and programmes. In December 2016, the Agency organized an experts meeting in Vienna with seven experts from three Member States, the Food and Agriculture Organization of the United Nations (FAO) and WHO to explore recent innovations in the field of quantifying dietary energy intake and energy expenditure, and the use of nuclear technology to validate these new methods. The experts made recommendations on future work to validate technological advances in the field of dietary intake and energy expenditure against the doubly labelled water technique (Fig. 3). This technique is a stable isotope reference method for accurate measurement of the amount of energy a person uses each day for everyday activities (total daily energy expenditure). Validating these advances will clarify their strengths and limitations before they are used in large scale surveys in low resource settings.



FIG. 3. An example from Mozambique of a traditional dietary intake assessment by quantitative 24-hour dietary recall using pen and paper. Efforts are under way to develop a tablet based application for conducting such assessments, which will be validated using the doubly labelled water technique.