WHO Regional Reference Centres

In 1968, two years after the IAEA began its postal checking service to dosimetry laboratories, a panel meeting was held at Caracas with WHO participation. It was agreed that the complete absence of national laboratories for standardizing radiation measurements in most regions of the world warranted the setting-up of regional secondary standard dosimetry laboratories, with suitable equipment and expert staff.

The actual establishment of such Centres resulted from a consultative meeting between experts from WHO and IAEA in Geneva later in 1968. This programme is supported by both Organizations both financially and through the sending of experts.

Dr. Berndt Waldeskog of the WHO Radiation Health section summarizes the implementation of the project, which has been undertaken by WHO.

Firstly it was agreed that in order to use ionizing radiation to the best advantage it was necessary to be able to measure the amounts of radiation used with an accuracy which depended on the particular application:

- *In* **diagnostic radiology,** *dosimetry will help reduce progressively the amounts of radiation administered to patients, without reducing the information obtained.*
- *In* **radiation protection** *dosimetry is necessary to ensure the safety of the people who may receive radiation in the course of their work, and to avoid excessive radiation exposure to the public.*
- *In* **radiation therapy** *it is necessary to have dosimetry of the greatest practical achievable accuracy, in order to ensure the best treatment. This is the most important aspect of dosimetry.*

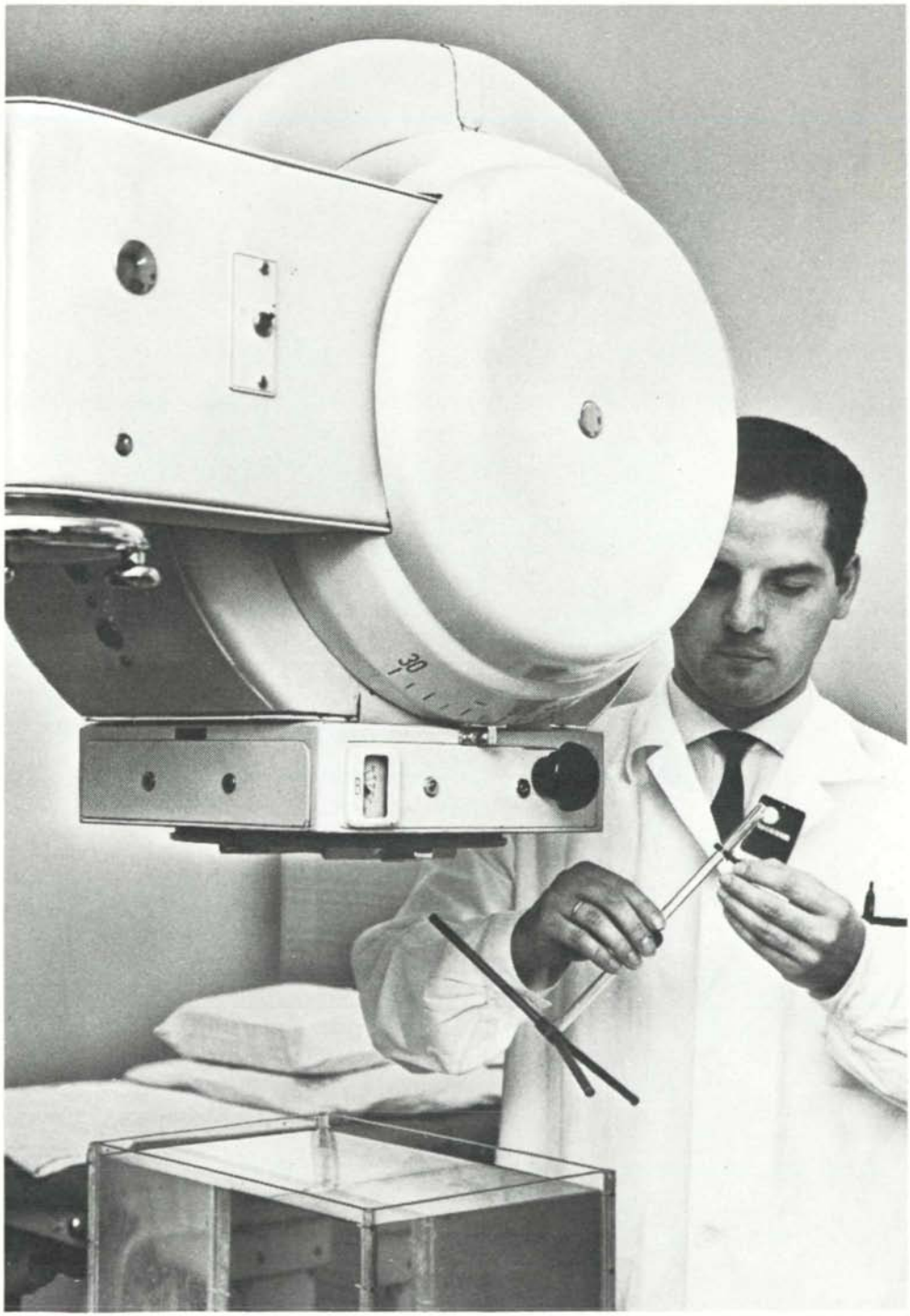
In some countries there has been active collaboration for many years between radiotherapists and physicists, so that radiation doses administered to patients are well controlled. Radiation dosimeters used are checked regularly against a primary or secondary standard dosimeter of a National Standardizing Laboratory. In many countries, however, radiotherapy centres use dosimeters without calibration, and in some cases dosimeters are used under conditions for which they were never designed. Unless dosimetry is accurate, patients will receive either excessive radiation, causing damage, or insufficient radiation, thus losing the chance of cure. Problems due to inaccurate measurements are equally serious in diagnostic radiology and in the field of radiation protection.

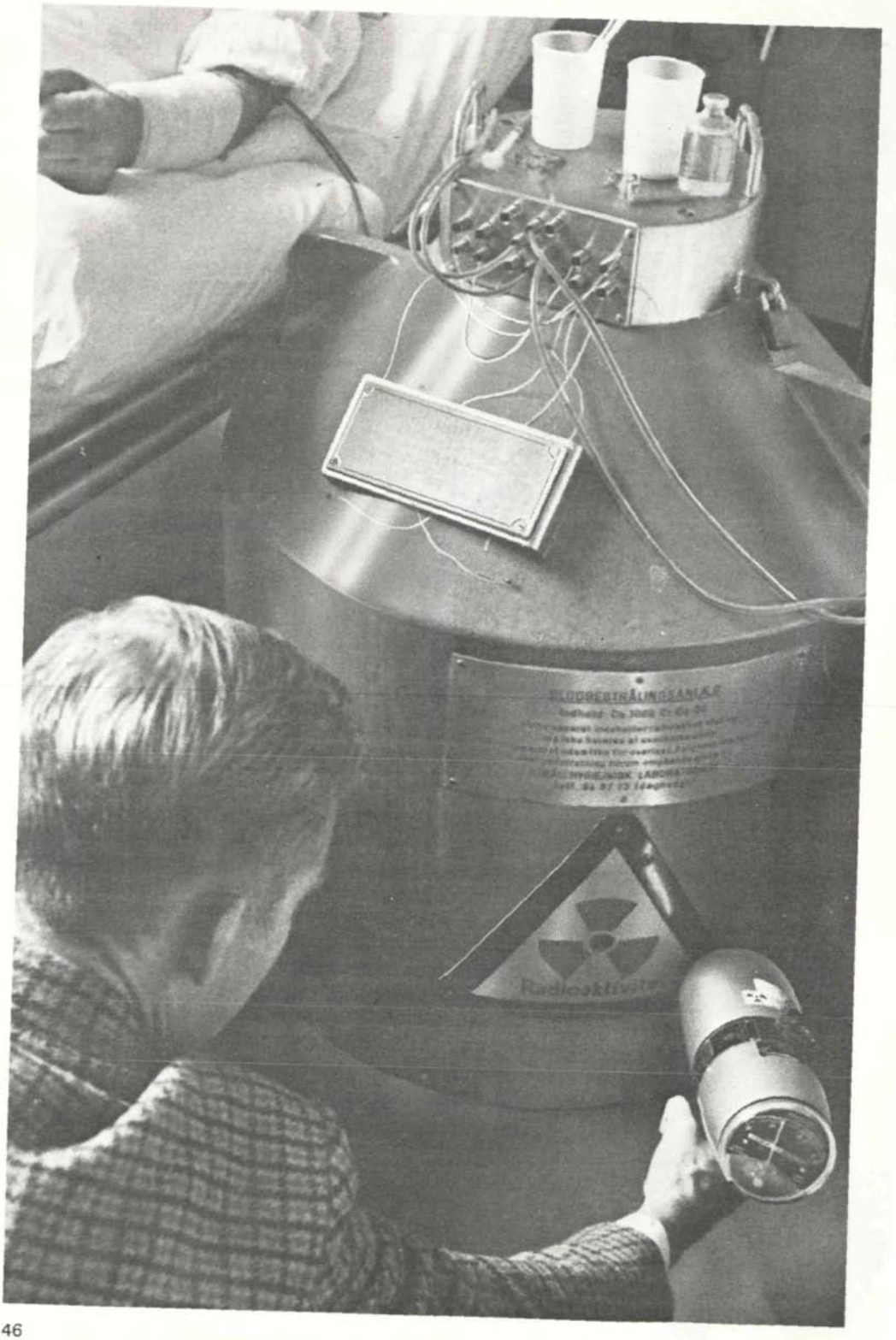
How can this situation be improved?

Dose measurements of ionising radiation must of necessity be based on measurements made with one of the primary standards in the Bureau International de Poids et Mesures

At a hospital a physicist lowers a dosimeter – the tiny black capsule – into a water tank which simulates the body of a patient. After exposure to 500 rads from the Cobalt-60 source above the tank the dosimeter is sent to the IAEA for evaluation – IAEA ▶

for Secondary Standard Dosimetry




Radioaktivitet

(BIPM) or in a National Standardizing Laboratory. Such primary standards are the only dosimeters for which dosimetry is derived from fundamental principles. Almost all of them are at present using the principle of ionisation of gases; it is also possible, however, to set up primary standards directly measuring the absorption of energy in matter. All primary standards are complicated, and require the highest possible scientific skill to achieve satisfactory results. It is not necessary or practical to set up such a primary standard in each country.

One of the main functions of the National Standardizing Laboratories is to calibrate secondary standard dosimeters against their primary standards. Such a secondary standard dosimeter can then be used for the calibration of field instruments; this calibration will only be slightly less accurate than calibration directly against a primary standard if the secondary standard dosimeter is of a suitable design. It is in any case impossible for all field instruments to be directly calibrated against the primary standard. In some countries the national standardizing laboratories have calibrated secondary standard dosimeters, which are then used locally for the calibration of field instruments. It would be perfectly practicable to make a similar arrangement for the calibration of field instruments in other areas of the world.

At the WHO/IAEA 1968 Geneva meeting it was agreed to set up secondary standard laboratories for radiation dosimetry in different parts of the world, adequately equipped with scientific staff, dosimeters and radiation sources. The laboratory should be headed by a Physicist experienced in dosimetry and of high professional responsibility. The laboratory may be attached to a hospital or radiotherapy centre, but must be administratively independent of it and available to calibrate dosimeters for any institute in the area for which it is set up.

The main duties of the laboratory are to:

1) maintain secondary standard dosimeters and radiation sources;
2) calibrate radiation measuring instruments used for clinical dosimetry and radiation protection purposes, and issue certificates;
3) provide in-service training of radiologists, medical physicists, and health physicists in dosimetry;
4) give advice on radiation dosimetry in clinical work and radiation protection;
5) if needed, take measurements of output of machines used for clinical purposes and carry out radiation protection measurements;
6) arrange dosimetric intercomparison;
7) keep up-to-date and check the literature on dosimetric methods, and carry out research on radiation dosimetry.

WHO in collaboration with IAEA has so far established 6 secondary standard dosimetry laboratories, viz. in Argentina, Romania, Mexico, Thailand, Singapore and Iran. All 6 laboratories have been designated as WHO Regional Reference Centres and the official title of the Centres is "WHO Regional Reference Centre for Secondary Standard Radiation Dosimetry in collaboration with IAEA".

◀ The special cobalt-60 blood irradiation apparatus at the National Hospital, Copenhagen – WHO

Priorities have been given to areas of the world where radiation medicine with special emphasis on radiotherapy has already reached a certain degree of development and where there is an urgent need for better dosimetry.

In this context it must be underlined that the building up period of such a laboratory is several years.

The first step is to equip the laboratory with radiation sources and measuring instruments, especially secondary standard dosimeters. This will take one to two years, especially as the dosimeters after purchase have to be carefully checked and calibrated by national standardizing laboratories. This has up to now been undertaken by Physikalisch-Technische Bundesanstalt (PTB) in the Federal Republic of Germany.

The second step reached within two to three years is the performance of routine calibrations of clinically used dosimeters and radiation protection instruments for customers.

The third step to be reached within three to four years is to undertake research on the practical application of radiation dosimetry.

During the second or third step training courses for radiologists, medical physicists and health physicists in dosimetry may start.

The WHO has given each established Centre financial support to be used for the supply of special secondary standard dosimeters and other tools needed for calibration work, and for special training of the staff running the laboratory and the provision of consultants. All dosimeters have been carefully checked and calibrated at a National Standardizing Laboratory before being sent to the Centre.

It is anticipated that in the long run, the establishment of a network of WHO/IAEA secondary standard dosimetry laboratories will lead to an improvement of radiation dosimetry in all its aspects, and link measurements performed all over the world to the highest authority in this field, the Bureau International des Poids et Mesures (BIPM).