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THE ROLE OF THE IAEA CODES OF PRACTICE IN THE RADIATION DOSIMETRY DISSEMINATION CHAIN

P. ANDREO
Medical Radiation Physics, Stockholm University - Karolinska Institute
Stockholm, Sweden

More than 30 years ago the International Atomic Energy Agency (IAEA) published on behalf of IAEA, WHO and PAHO its first Code of Practice (CoP) for radiotherapy dosimetry, TRS-110 [1]. Aimed at kV x-rays, ^{60}Co and ^{137}Cs therapy in developing countries, and based on roentgens and rads, "old book" readers will still find interesting practical recommendations like QA procedures that include radiographs of the ionization chamber to check that the internal electrode construction has not moved. TRS-110 was also the first and only CoP with the distinction of including the name of the author in its cover, John B Massey, recognizing that IAEA acted solely as a publisher.

For the following almost 20 years IAEA dosimetry activities have prioritized the development of a Network of Secondary Standard Dosimetry Laboratories (SSDLs) [2]. In addition to disseminating traceable radiation metrology standards, in some countries the SSDLs have played the important role of compensating the lack of qualified medical physicists. The balance between radiation metrology and medical physics has now shifted towards the first area and the IAEA recommends that SSDLs should not perform the duties of medical physicists except in dire situations [3]. During this long period, there were no updates of TRS-110 or a new IAEA CoP published, even if different generations of national dosimetry protocols had emerged. The absence of IAEA recommendations favoured the arbitrary use of such national protocols, mostly issued in UK and USA, with the result that multiple protocols were used within a given country and there were no practical links between medical physics and SSDLs except for detector calibrations.

The publication in 1987 of the TRS-277 Code of Practice [4] established a quantum leap with regard to the Agency's role in harmonizing international radiotherapy dosimetry. A new generation of N_K-based national protocols had emerged in the early eighties, and the authors of TRS-277 were chosen among those of the national protocols. The goal was to develop an international CoP with the best of each national protocol, avoiding known imperfections and limitations. TRS-277 was addressed to both medical physicists and SSDLs worldwide, establishing homogeneity at all levels of the dosimetry chain, and it was adopted by several industrialized countries, ending with the thought that IAEA recommendations were addressed solely to developing countries. Interesting enough, in some other countries TRS-277 was seen as a competitor of the national protocol (even if this was among the "parents" of the new CoP) rather than as an update, which was often referred to as a "cosmetic change".

Due of its wide dissemination, TRS-277 became the "standard protocol" against which the others were compared. Its data were included in practically all the dosimetry recommendations published since 1986, following an "explosion" of national protocols, and many investigations have used "modified" national dosimetry protocols that incorporate TRS-277 data. The CoP has been translated into many different languages, even if the only non-English version formally released by the Agency has been in Spanish.

Like any other protocol, TRS-277 had also imperfections. Some of the correction factors had been included without a proper verification, and they turned out to be in error. Among these were certain perturbation correction factors in kV x-rays and high-energy photon and electron beams. A second edition of TRS-277 was published in 1997 correcting for these deficiencies [5]. A major limitation (and criticism) had been the lack of detailed procedures for dosimetry based on the use of plane-parallel chambers, and the CoP was complemented the same year with TRS-381 [6] for that purpose. Being released in a period of dynamic changes, when new standards were being developed, TRS-381 served as the bridge between N_K- and $N_{D,w}$-based CoPs.

The most recent international Code of Practice for radiotherapy dosimetry, TRS-398 [7], is based on standards of absorbed dose to water, following the development of these standards during the last decade. To establish uniformity in the dosimetry of the various radiation beam types used in radiotherapy the so-called k_Q formulation was extended to kV x-rays, ^{60}Co gamma-rays, high-energy photons, electrons, protons and heavy ions. This CoP includes the various ionization chamber calibration possibilities available in different national standards laboratories, from ^{60}Co to direct calibrations in high-energy photon and electron beams. When experimental beam quality factors are not available, TRS-398 provides theoretically determined k_Q factors which, together with a $N_{D,w}$ chamber calibration in ^{60}Co, form the basis for reference radiotherapy dosimetry. Like TRS-110 30 years ago, the new CoP has been sponsored by several international organizations, this time IAEA, WHO, PAHO and ESTRO. Less than 2 years after its publication TRS-398 has become the protocol to be used in many countries, so that its role in the dosimetry chain is already well established.

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