Role of the IAEA in education and training of radiotherapy professionals in Asia Pacific

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Summary

In partnership with the Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology (RCA), the IAEA has been supporting Member States in the Asia and Pacific region to prepare, initiate and expand radiotherapy services safely and effectively. Education and training are essential components in IAEA-RCA projects and have been delivered through various initiatives both online and offline. In addition to building capacity and enabling technology transfer, these initiatives provided opportunities to foster collaboration at the regional level, leading to the initiation of professional societies and education/training schemes.

Key words: education and training; physics; radiation oncology; regional collaboration.

Background

The International Atomic Energy Agency (IAEA) is an organization in the United Nations system with a mandate to support the safe and secure peaceful applications of nuclear technology. The human health programme of the IAEA supports Member States in enhancing their capacity to address needs related to prevention, diagnosis and treatment of diseases through the application of nuclear and related techniques. The IAEA has been a major global actor supporting technology transfer and promoting access to cancer treatment.

Both directly as well as in partnership with the Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology (RCA), the IAEA has organized various Technical Cooperation projects to support 35 Member States in the Asia and Pacific region prepare, initiate and expand radiotherapy services safely and effectively. In addition to the Technical Cooperation Platform, online educational resources such as the Human Health Campus, webinars and e-learning modules have been made available, utilizing advances in information and communications technology (ICT) to facilitate access and maximize impact.

This article summarizes IAEA’s initiatives in the education and training of radiation oncologists and medical physicists in the Asia and Pacific region.

Radiation oncology

Shortage of radiotherapy equipment and personnel, compounded by lack of access to education and training opportunities have been prevalent issues in developing countries, including many countries in the Asia and Pacific region. In a report published in 2001 on the status of radiotherapy resources in 17 countries in the region, 11 countries had an inadequate number of teletherapy machines and all but 3 countries faced a shortage of radiation oncologists.1

Over the two decades following the publication of the report, the governments of IAEA Member States in Asia and Pacific region through respective project counterparts have worked together within the framework of the RCA to improve the quality of radiotherapy services in the region. In the last 10 years, the IAEA has been supporting 76 radiation oncology projects at the national and regional level in Asia and Pacific region, addressing the diverse challenges faced by Member States related...
to radiotherapy in cancer management (Fig. 1). Upon requests by its Member States, these projects supported a wide range of activities at different levels of radiotherapy services, from formulation of a national cancer control program to expansion of existing programmes.

Quality improvement and introduction of new technologies have been supported through a series of IAEA-RCA projects starting with RAS6040 in 2004 which aimed to improve the quality of radiotherapy in the region through training and quality audits, followed by RAS6048 which addressed transition from 2D to 3D Conformal Radiotherapy in 2007 along with its follow-up project RAS6053. Sequentially following the evolving capacity of Member States, other projects addressing transition to Image-Guided Brachytherapy (RAS6062), Intensity Modulated Radiotherapy (RAS6072) and Stereotactic Body Radiotherapy (RAS6065 and RAS 6085) were then introduced to strengthen the capacity of Member States in implementing the techniques in a safe and effective manner. Between 2007 and 2017, the projects assisted the initiation of 3D Conformal and Intensity Modulated Radiotherapy (IMRT) in 4 Member States and increased the number of radiotherapy centres implementing these techniques from 396 in 2013 to 538 in 2017. By the end of 2017, 16 of 19 participating Member States have established a pool of trained personnel, developed Quality Assurance programmes at the local/national level and provided IMRT to 10-40% of all patients treated with radiotherapy.

In addition to addressing quality improvement and introduction of new technologies, IAEA Member States also explored innovative ways to support education and training of radiotherapy professionals in the region. The Applied Sciences of Oncology Distance Learning Program (ASO)² is an example of such initiative, in which IAEA Member States in the Asia and Pacific region played an active role. ASO was designed to bring distance learning to radiation oncologist trainees throughout the world, allowing them to supplement their clinical training with 80 specialist modules covering 8 subject areas. The course was distributed as CDs to all IAEA Member States in the region and was available for download on the IAEA Human Health Campus. In 2014, the distance learning course was migrated to an online course format on the IAEA’s open learning management system (CLP4NET) and was restructured into 82 modules on communication, critical appraisal, functional anatomy, molecular biology, pathology & pathogenesis, patient care, physics & radiation technology, radiobiology and systemic therapy for cancer.³ By utilizing ASO along with the previously published Syllabus for the Education and Training of Radiation Oncologists,⁴ Member States have been able to improve and expand their existing training programmes.⁵

Through training courses and meetings organized under these Technical Cooperation projects, the IAEA initially served as a surrogate for a professional organization in the region, developing the capacity and laying out the groundwork when such connections did not exist. Since 2010, 74 courses have been organized in which more than 900 participants have been trained. More than 250 fellowships have been organized to further facilitate capacity building at the national level, and more than 100 experts from Member States in the region have been mobilized (Table 1). Fellowships are mechanisms through which the IAEA offers nominated individuals (typically young professionals) the opportunity to learn or update their knowledge in a specific field. The fellow is placed in a host institution under supervision for a timeframe that spans a few months or years. The progress of the fellow is reported to the IAEA. In specific cases, the fellowship can cover full academic education or clinical training.

As expertise was solidified at the national and regional level and collaboration fostered, the region has in turn educated a new generation of radiation oncologists and laid out the foundations upon which even stronger partnerships emerged. The South East Asian Radiation

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Fig. 1. IAEA Technical Cooperation (TC) projects in radiation oncology or with a strong component of radiation oncology between 2010 and 2020, Asia Pacific.
Oncology Group (SEAROG) and the Federation of Asian Organizations for Radiation Oncology (FARO) are two major professional organizations providing educational opportunities for radiation oncologists in the region which stemmed from close collaboration among radiotherapy professionals in various IAEA-RCA projects at the regional level. Both organizations have become important actors in the region. Most of the founding members of both organizations, who have been counterparts in various IAEA-RCA projects at the regional level. Both organizations have become important actors in the region. Most of the founding members of both organizations, who have been counterparts in various IAEA-RCA projects, are still making continued efforts to sustain the momentum achieved in the projects to continue providing educational opportunities for radiotherapy professionals and maintaining strong partnerships in the Asia and Pacific region.

Two recently initiated IAEA-RCA projects, RAS6086 and RAS6096, share the common objective of further strengthening these partnerships in education and training. In RAS6086, this is done through training of radiation oncology professionals in collaboration with national/regional radiation oncology societies, while in RAS6096 online collaboration is empowered through online clinical networks in collaboration with the Asia Pacific Radiation Oncology Special Interest Group (APRO-SIG) of the Royal Australian and New Zealand College of Radiologists (RANZCR).

Medical physics

Medical physicists working in clinical settings are health professionals with postgraduate level academic education who have undergone structured and supervised clinical training to acquire the competencies needed to work independently in one or more specialties of medical physics.

Medical physics has been classified as a health profession since 2008, however, recognition is lacking in many countries, which impacts access to adequate academic education and furthermore, limits clinical training opportunities. The roles and responsibilities of medical physicists working in a hospital are diverse and extensive and therefore, their contribution to patients’ health care is clear.

In the region of Asia and Pacific, the IAEA has supported medical physics (imaging, radiation oncology and dosimetry) in 121 Technical Cooperation projects over the last 10 years: 100 national, 19 regional and 2 inter-regional projects (Fig. 2).

To best support medical physics in the Region and tackle harmonized academic education and clinical training, milestones have been developed and refined over the years.

In general, there is a global lack of clinically qualified medical physicists, whilst in parallel radiation, medicine is expanding and evolving, incorporating complex technologies that require fine-tuned quality management.

Table 1. Activities organized under IAEA Technical Cooperation (TC) projects in radiation oncology or significant radiation oncology component between 2010 and 2020, Asia Pacific

| Activity type     | Number of activities | Total participants | Home countries | Host countries |
|-------------------|----------------------|--------------------|----------------|---------------|
| Fellowships       | 266                  | 266                | 25             | 34            |
| Courses           | 74                   | 966                | 35             | 28            |
| Expert missions   | 72                   | 117                | 18             | 28            |

Fig. 2. IAEA Technical Cooperation (TC) projects in medical physics or with a strong component of medical physics in the decade 2010–2020, Asia Pacific.
systems to which medical physicists are core contributors. Increasing the number of clinically qualified medical physics professionals is therefore key to supporting the safe, quality and effective use of nuclear science and technology in health care and to sustain its development.

To sustainably support capacity building in medical physics in the Asia and Pacific Region, sequential projects were developed under the RCA. The path started in early 2000 when, through a series of consultations and meetings, clinical training guidelines were developed under the project RAS6038 in all three specialties of medical physics. The guidelines, modular and competency-based, offer a high degree of adaptability to Member States needs and were subsequently published as IAEA Training Course Series: in 2009 in the field of radiation oncology medical physics,9 2010 diagnostic radiology medical physics10 and in 2011 nuclear medicine medical physics. These guidelines are freely downloadable from the IAEA website and available in English, Russian, French and Spanish. The implementation pathways described in the guidelines were also piloted under RAS6038.

In the Asia and Pacific region, for capacity building in medical physics to be sustainable, it is necessary to take into account the geographical specificities of the vast and diverse region. In this respect, the idea of developing an online tool to enhance clinical training was advanced. The tool was developed in 2014 under the RCA project RAS6077 and named AMPLE, an acronym that stands for Advanced Medical Physics Learning Environment. This tool is still active today and offers residents in medical physics a personal space with access to educational materials, networking and remote mentorship, thus complementing and enhancing their clinical training experience in the hospital.12 Organized links to updated educational resources and online mentoring by experts in the field are benefits of this platform. AMPLE also fosters collaboration at the regional level, while allowing for the residents to undergo clinical training in their country. The mentoring system also supports supervisors, through linking senior professionals and allowing peer review of programmes by external examiners, for instance.

Currently, AMPLE is used by professionals in Bangladesh, Cambodia, India, Indonesia, Malaysia, Myanmar, Philippines, Singapore and Thailand. More than 200 residents (all medical physics specialties included) are connected through AMPLE.

The AMPLE platform is currently being further developed to offer more powerful and easily accessible management tools to its users and to the administration team. Furthermore, the educational resources are being updated and reorganized for all three medical physics specialties. The ultimate goal of AMPLE is to facilitate the establishment and implementation of clinical medical physics training programmes to ensure that highly specialized, appropriately qualified professionals are available in all Member States in adequate numbers to ensure the safe, quality and efficient application of radiation medicine for the benefit of patients.

Radiation therapy

As a key member of the radiotherapy team, Radiation Therapists (RTTs) hold a crucial role in ensuring the safety, accuracy and quality of the treatment.

In 2005, the IAEA published a syllabus for the education and training of RTTs,13 describing the minimum acceptable components of RTT training programme. A Regional Training Course for professionals involved in the training of RTTs in Member States was later organized in 2007 under RCA Project RAS6040. In the training course, the syllabus and its methodologies were reviewed within the framework of establishing local training programmes for RTTs. A revision of this document was published in 2014.14

Unfortunately, viewed within the perspective of the comparatively positive developments in radiation oncology and medical physics, the education and training of radiation therapists (RTTs) has seen comparatively little improvement. With the exception of several Member States with strong academic and professional frameworks for RTTs, members of the profession often do not receive enough education and recognition to fulfil their roles and develop their career structure. RTTs in the region also tend to be less proficient in English while the diversity of national/local languages means there is no regional language which can be used as an alternative. This poses a unique but significant barrier which is less pronounced in other regions such as the generally Russian-speaking Eastern Europe, Spanish-speaking Latin America or French-speaking Francophone Africa.

At the same time in Europe in 2007, European Society for Radiotherapy and Oncology (ESTRO) and the IAEA embarked on a Train-The-Trainer (TTT) project on Best Practice in Radiation Oncology, which resulted in significant progress on improving RTT education in Europe15 and is being adopted at the national level, for example in India. Taking the collective experiences from the TTT and AMPLE projects, the IAEA is developing an educational platform to support the Member States in initiating and implementing training programmes for RTTs.

Conclusion

Over the last two decades, IAEA and RCA supported the education and training of radiation oncology and medical physics professionals in Asia Pacific on multiple levels both offline and online. Through collaborations in projects with significant education and training components, strong connections have been developed among radiation oncology and medical physics professionals in the region, leading to the initiation of professional organizations and regional training schemes. There is still much
to be done as radiotherapy is still unavailable to more than half of the population in the region, but as the region develops and strengthens its pool of expertise, new opportunities for collaboration will emerge, allowing innovative solutions to be explored.

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