

revision of the RTT core curriculum defines the core competences for newly qualified RTTs. A competence can be described as a quality, ability, capacity or skill that is developed by and belongs to the learner. In the context of this document a competence shows a capability on the part of an RTT and demonstrates an ability to integrate knowledge, skills and attitudes to meet specific needs in a range of situations. The core curriculum defines the competences a new qualified RTT should have attained. The core competences were based on a comprehensive survey of the RTT scope of practice in 26 European countries. Some of these competences have elements that are generic to a wide range of healthcare disciplines where others are RTT specific. The competences are divided into clinical competences and the academic competences necessary to develop the competences for practice.

To facilitate this approach the third revision of the core curriculum for RTTs focuses on competences linked to learning outcomes and the essential knowledge and skills necessary to underpin practice. This approach reflects the changing practice and professional status of RTTs and is based on the competences required to practice as an RTT. One of the aims of the curriculum is to provide a guide to educators developing or amending RTT educational programmes. At a basic level, this current revision outlines the required curriculum topics necessary to underpin the basic core competences expected of RTTs in the clinical setting and at a higher level it reflects the necessary content for RTTs undertaking significantly greater responsibility over a wider range of tasks. This revision focuses on the fact that optimal education requires RTTs are able to integrate knowledge, skills, attitude and judgment in order to be able to perform a professional activity adequately in a given clinical situation.

However, this new competency-based approach requires that educational programmes are broadened to include the defined competency areas with emphasis on quality training in a practical environment, competency-based supervision and evaluation during training. There are many challenges associated with this change. Teaching, learning and assessment must be focused to assure graduates attain the qualities and attributes desired in a competent RTT practicing in an evolving clinical environment and that the programme equips RTTs with those attributes needed to competently perform those tasks now and into the future.

The new curriculum outlines appropriate teaching, assessment and evaluation methods for a competency-based curriculum but it is up to the educational institute and/or the national society to suggest which methods should be used and how they should be implemented in their national context.

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Use of virtual reality in an educational environment

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Although still in its infancy, virtual reality (VR) tools have become available for radiotherapy training, enabling all groups of staff to simulate and train clinical situations without interfering with the clinical workflow, and without the risk of making errors.

Immersive tools like a 3D linear accelerator, 3D display of dose distributions and IT-laboratories with clinical software have been integrated in training. A new learning practice in connection with both theory and clinical training has been developed. In this "third context" the students have the possibility to acquire new skills before implementation in the clinic. The gap between theory and clinical work are broken down and learning activities are integrated in a mutual process. VR tools are very useful for all groups of students.

At basic level training with the pendant, positioning of patients, understanding in spatial processes, education in IGRT with bone match and IMRT dose planning are some of the possibilities.

Implementation of novel clinical treatments calls for education and training of experienced staff. An educational environment with VR tools, as part of the bridge building, is essential; e.g. implementation of adaptive strategies (ART) with plan of the day selection in bladder cancer. For this a lesson plan with lecture, e-learning, hands-on training, follow up meetings and tests were scheduled. Depending on clinical function some groups were offered only one or two of the sessions, while the radiation therapists (RTT's) received the three learning sessions with a combination of lecture, e-learning and hands-on training. Follow up meetings were organized ongoing. The hands-on training was organized with interaction between 3D accelerator (demonstrating anatomy at pelvic and normal tissue that might be spared) and training in plan selection in the IT-laboratory. Finally the participants completed a test with selections of plan of the day. The selected plans were afterwards compared to a gold standard, selected

from both an experienced physician and physicist. Evaluations like "I'm not so concerned more, the exercises gave me confidence" and "A course like this gives me confidence before a real patient has to be treated" were recorded. It is recommended to schedule the education in a VR environment immediately before use of the novel treatment for patients.

Next initiatives using VR is implementation of ART projects with soft tissue match of lung tumors and plan of the day selection in cervix cancer. The experience from these projects will later be incorporated in education and training at basic level.

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A post registration training programme for RTTs to support the implementation of advanced IGRT in the UK

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Purpose. The NRAG report¹ set the UK national strategy for radiotherapy and has been the template for development of services. The expectation in the NRAG report was that 4D adaptive radiotherapy (4D-ART) would become the standard of care. The UK National Cancer Action team then published a report² to provide guidance to the multi-professional team in the implementation of image guidance strategies. The vision for this was to support the wider adoption and application of IGRT throughout England and to move closer towards 4D ART being standard for appropriate patients. RTTs will all require training in image guidance techniques which they will be using for the majority of patients.

Role of Clinical Trials in IGRT and QA issues. A number of national clinical trials involving IGRT are recruiting patients. The UK Radiotherapy Trials Quality Assurance (RTTQA) group undertakes a programme of activities in relation to individual trials to ensure protocol adherence. For IGRT related trials, there is a need to verify competence of IGRT processes, both registration and subsequent action. The RTTQA group have been investigating methods for this to be assessed which may enable a programme to be developed which will assess practical aspects of image guidance for image registration and be able to be undertaken in more departments.

Development of Post-graduate MSc Modules. There are 2 UK Universities currently offering specific image guidance MSc modules which have been developed to support UK RTTs. These modules have been written by members of clinical departments to incorporate technical and clinical issues. Academic collaboration and accreditation provides quality assurance in terms of module structure and assessment. Both modules contain similar content and assessment methods and aim to:-

(i) develop in-depth knowledge of advanced medical imaging techniques and protocols applied to radiotherapy planning and patient management

(ii) develop critical awareness of the issues surrounding treatment verification and its importance in achieving accurate treatment

(iii) facilitate an advanced level of understanding of the principles and practice of a variety of relevant IGRT equipment

(iv) to develop the ability to critically evaluate clinical imaging protocols

(v) promote role development and inter-professional working for oncology practitioners.

There is also a requirement to assess the practical ability to perform effective clinical interpretation and evaluation of images utilised in the radiotherapy process. A module to assess this has also been developed.

Module Content and Assessment Methods. The modules are taught using an interactive style using examples of where theory links to practice. They utilise a combination of lectures on key concepts, tutorials and self study appropriate to an essentially problem solving approach designed for post graduate students.

Example of content includes :-

(i) types of equipment which can be used for IGRT

(ii) geometric errors of radiotherapy techniques

(iii) dose considerations associated with IGRT

(iv) stereotactic principles and techniques

(v) interaction between IGRT and radiobiological modelling

Module assessment is either utilising a structured portfolio of case studies or a review of a specific IGRT technique.

The module designed to assess practical aspects of IGRT incorporates a combination of lectures with directed practical image registration/analysis. The practical aspects module is assessed using a computer based image analysis exam plus a presentation.