Teaching Lecture: General introduction to head and neck radiotherapy

SP-0188
General introduction to head and neck radiotherapy
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Teaching Lecture: e-Learning for Professionals in Radiation Oncology: What, Why and How?

SP-0189
e-Learning for Professionals in Radiation Oncology: What, Why and How?
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Radiation Oncology is a dynamic and evolving field. Professionals need to find efficient and effective ways to stay informed of the latest developments, to collaborate and exchange knowledge with others, and to update or acquire new skills and competences.

E-Learning is an excellent way to achieve this. E-Learning is defined as the use of information and communication technologies to enable learning and performance. It has the potential to help radiation oncologists around the world to develop their competences whenever they want, at any time; allowing them to tailor their learning experiences to their goals, preferences, and needs.

This lecture will introduce the concept of e-Learning and its role for professional development in Radiation Oncology. It will present practical examples and strategies for young scientist to stay updated with recent findings and guidelines in the field, to develop their competences, and to find peers and opportunities for collaboration.

Symposium with Proffered Papers: Quality beyond accuracy: are we failing to see the forest for the trees?

SP-0190
Has higher accuracy in treatment delivery translated into noticeable improvements in clinical outcomes
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We will define ‘accuracy’ as delivering the desired radiation dose to the target whilst minimising as much dose as possible to the surrounding normal tissues, thus embracing the classical balance which must be achieved with all radiotherapy.

The process begins with identifying the target, and therefore includes improving imaging for target volume delineation. Nevertheless, considerable uncertainties still exist especially in the personalisation of the Clinical Target Volume (CTV). Better conformation of dose to target shape has been a long term objective, beginning even in the ortho-voltage era. The biggest step, a revolutionary change, was the introduction of 3D conformal RT. IMRT represents ‘ultra-conformal’ treatment. Use of proton and carbon ion beams represents further steps along this path.

Improving accuracy also includes ensuring that today’s highly conformal treatment plans are actually delivered to the target, without missing, and not to surrounding normal tissues. This brings us to image guidance, which appears to be vital, especially with steep dose gradient IMRT plans, but which is difficult (perhaps impossible) to test using the conventional trial paradigms.

A further concept is that the planned dose may differ from the accumulated delivered dose (DA), as the result of patient or tumour changes. Computational developments mean that individual patient DA can be estimated in a research setting using daily image guidance scans, so that clinical implementation will need to be addressed.

An additional development is the use of real time imaging during the exposure to monitor patient or organ movement, using X-ray or MRI approaches.

In terms of clinical outcomes, good evidence exists that better imaging improves outcomes. The introduction of 3D CRT, perhaps the most important step of all, has a strong evidence base. IMRT is also supported by strong clinical evidence. There is highly suggestive evidence that charged particle beams have a valuable role. Sadly, there is also good evidence that bad quality in plan preparation and delivery leads to worse local control and survival (TROG). Image guidance is a more challenging component of the radiotherapy chain for which to provide hard trial evidence, although it has a clear rationale.

Overall, there is a definitive evidence base that better accuracy improves outcomes for both tumour control and normal tissue sparing using current technologies. Additional opportunities are also developing, making this is a truly exciting time to be working in radiation oncology.

SP-0191
The patient: an active partner in quality and safety process in radiotherapy
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Beyond the technological advances to improve radiation therapy, the patient can also actively participate in its care process and contribute to ameliorate its management. The patient is a key player in security and improvement care processes. The patient’s needs and expectations can be harvested through satisfaction surveys, adverse event declarations, records of complaints and patient committee.

An important place in our Radiotherapy Department is given to harvesting and processing patient’s opinions to add value for it. In order to know the views of patients on the quality of our services and help us to improve it, we have developed a survey covering 6 themes. Figure 1 shows the surveys’ results of the last three years for the 6 themes, which are close or greater than the institutional goal.

![Figure 1: Patients satisfaction surveys results](image-url)

A patient committee is under construction. This committee, including former treated patients, will meet to discuss the satisfaction rates and improvement actions.

We also collect complaints and unexpected events. These are declared on adverse event reports. These reports are investigated during Experience feedback committee (EFBC). Through these different channels the patient is actively involved in the quality processes of the Radiotherapy
Department. Thus, the patient becomes a key actor in the quality and safety of its own treatment.

In conclusions: empowerment of the patient is essential for two reasons, on one hand at the individual level by strengthening its capacity to act on health determinants and on the other hand at the organizational level with continuous improvement of the Radiotherapy Department. Our goal is to strengthen the quality and safety of treatments, adjust them to the life project of the patient and promote a participative approach focused on the patient’s needs and expectations.

SP-0192
Beyond accuracy: how can medical physics help improve treatment quality?
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It has often been claimed and acknowledged that Radiotherapy (RT) as a modality to combat cancer has been technology driven, or even physicist driven. Higher energies, better accuracy, computerised delivery systems, improvements in imaging are all examples of this. Together with increased knowledge of how to combine RT with e.g. systemic treatments, RT has remained one of the most important tools in cancer therapy. The continuous improvements of RT have often involved complex technology, less intuitive to its nature than earlier technologies. It has been one of the most pronounced duties of the medical physicist to ensure that the clinical introduction of such new technologies has been done with the highest possible safety standards and that any risk associated with the new technology could be brought to an absolute minimum. As a result RT, in particular advanced RT, is a very safe modality compared to almost any other hospital activities. In their quest for the highest possible level of safety, the medical physicist is often left alone with high demands, ambitions but with limited means and lack of understanding from the hospital management of the resources needed. As a consequence the clinical introduction of new, superior treatment options are delayed, months, years and sometimes even decades, and the patients have to be content with older methods, e.g. less conformal RT. This dilemma can be boiled down to the search for the optimal balance between quality (e.g. modern high precision treatments) and safety (reliable, well proven and understood methods). The priority often tends to go towards safety rather than quality since the focus from the general public as well as regulatory authorities always favours the latter at the expense of the former. As medical physicists, however tempting it might be to focus on safety only, must take a patient oriented approach and in all considerations include the aspect of what will be the most beneficial way from a patient’s perspective. Just as a high quality cannot apply if the safety issues are not properly handled, safety without quality is of limited value. In the search for the ultimate balance between quality and safety, the medical physicist is in a key position since no other profession has a better understanding of the technology, the physics and the interactions between different complex systems. A more patient-centred approach to accuracy, safety and quality can, however only result from a multidisciplinary strategy where different profession work together towards the common goal to offer the best possible treatment to all patients in need thereof.

OC-0193
Evaluation of models for plan QA using fully automated Pareto-optimal plans for prostate patients
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Purpose or Objective: Current IMRT treatment planning with commercial treatment planning systems is a trial-and-error process, based on a series of subjective human decisions. So the quality of the IMRT treatment plans may not be consistent among patients, planners or institutions with different experience. Different plan quality assurance (QA) tools have been proposed recently, that could flag suboptimal plans that may benefit from an additional treatment planning effort. However, since conventional treatment planning was used to validate these models, the inherent accuracy of the existing treatment planning QA models is unknown. Therefore we fully automatically generated a dataset of Pareto-optimal prostate IMRT plans using Erasmus -iCycle, an in-house TPS for fully automated, multi-criterial plan generation. This dataset was used to assess the prediction accuracy of an overlap volume histogram (OVH) based plan QA tool.

Material and Methods: 115 prostate plans were fully automatically generated using Erasmus-iCycle. These plans were based on a fixed ‘wish-list’ with constraints and objectives in a predefined order of priority. An existing OVH model was modified and used to predict DVHs for these patients. First, the entire DVH of the rectum, bladder and anus of a validation cohort (N=57) were predicted, using the plans of an independent training cohort (N=58). To investigate the impact on prediction accuracy of an enlarged training cohort, the DVHs were also predicted by a leave-one-out method. The predicted rectum Dmean, V65, and V75, and Dmean of the anus and bladder were compared with the achieved values to validate the OVH QA tool.

Results: For rectum, the prediction errors (predicted-achieved) were small: -0.2±0.9 Gy (mean±1 SD) for Dmean, -1.0±1.6% for V65, and -0.4±1.1% for V75. 72% and 96% of the predicted rectum Dmean had prediction errors within 1 Gy and 2 Gy, respectively. For Dmean of anus the prediction error was only 0.1±0.8 Gy, whereas for the bladder it was much larger: 4.8±4.1 Gy (see also Fig 1). Increasing the training cohort to 114 patients (using leave-one-out) led to minor improvement.

Conclusion: A dataset of consistently prioritized Pareto-optimal prostate IMRT plans was generated. This dataset can be used to validate any planning QA model and will be made publicly available at the Treatment Planning QA Section of http://www.erasmusmc.nl/radiotherapie/research/radiationoncologymedicalphysicsandimaging/research_projects. It was applied here to assess the accuracy of the OVH model. The OVH model was highly accurate in predicting rectum and anus DVHs. For the bladder large prediction errors were observed, which indicates that the OVH has difficulty in capturing the interdependence of sparing different OARs. We are currently