specificity to T2w MRI (reduction of false-positive findings), but its main value lies in its direct correlation between the choline-to-citrate ratio and tumor aggressiveness.

mpMRI currently more and more consists of T2w MRI combined with DWI. DCE is additionally performed in all cases by some institutions, or only in doubtful cases by others. Meanwhile, it remains very important that all mpMRI studies are performed according to uniform quality and reporting standards, as pointed out by the European Society of Urogenital Radiology Guidelines and the recently revised Prostate Imaging Reporting and Data System (PI-RADS version 2). The latter consists of a diagnostic probability scale, in which PI-RADS 1 and 2 signify “clinically significant disease (highly) unlikely”, PI-RADS 3 “clinically significant disease (highly) equivocal”, and PI-RADS 4 and 5 signify “clinically significant disease (highly) likely”. These scales are largely based on the unique ability of mpMRI to more easily detect high-grade and larger (i.e. clinically significant) tumors than small lower-grade lesions. This holds promise in the assessment of patients suspected of having prostate cancer. In patients who are candidates for active surveillance on the basis of clinical parameters, a PI-RADS 1 or 2 scale can corroborate this choice owing to a negative predictive value for excluding high-grade disease up to 98%, while in patients with a PI-RADS 4 or 5, a targeted biopsy can be performed in the suspicious area, including areas that are more difficult to reach with standard biopsy (e.g. anteriorly located tumors). PI-RADS 3, on the other hand, requires a biopsy in selected cases, taking into account clinical parameters such as PSA-density, PSA-kinetics, patient age and potential comorbidity. Hence, the performance for correcting patient treatment options. In active surveillance can be increased and mpMRI is currently recommended at enrolment in active surveillance by the UK National Institute for Health and Care Excellence (NICE).

SP-0106
Active surveillance: challenges and perspectives. The clinician point of view
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Prostate cancer (PCa) is the most common male malignancy. The number of diagnoses has increased since the introduction of the PSA in the early ‘90ies. Up to 50% of the new PCa detected can be considered clinically insignificant or indolent: this relatively new concept in oncology means that these very well localized, small and non aggressive tumors (GPS=3-3), which are generally diagnosed with a biopsy following PSA rises, would not cause symptoms and/or death during one’s life. Despite this non aggressive behavior, most of these tumors are still treated with curative standard therapies (prostatectomy, external radiotherapy and brachytherapy), which, although equally effective treatment options, are burdened by potentially severe side effects. As a matter of fact, there is no way to entirely distinguish upfront, before as well as after the biopsy, non aggressive, clinically insignificant, indolent tumors from aggressive, potentially lethal cancers that need to be treated immediately. To deal with the problem of overdiagnosis and overtreatment, active surveillance (AS) is being proposed in alternative to radical treatment to very selected men with favourable disease characteristics. AS is widely accepted in uro-oncologic communities and included in several guidelines, even if its routine application in the clinic is still suboptimal.

Understanding the natural history of clinically insignificant PCa is of primary importance to obtain reliable tools to select and follow-up AS patients. AS inclusion criteria are presently based onT2a at DRE, PSA/PSA density, number and percentage of positive biopsy cores and GPS. Originally, the approach was more restrictive (i.e. selection of very low risk PCa patients). Nowadays, considering that feasibility and safety of these more strict protocols were assessed, more inclusive protocols are enrolling patients (e.g. including selected GPS=3-4).

One of the main issues AS is currently facing is the chance of “inadequate” diagnoses from biopsies, known to result in upgrading and upstaging at prostatectomy, especially for low-grade PCa. PSA/PSA density or the number of positive cores at diagnostic biopsy do not appear to be associated with the probability of upgrading patients initially fit for AS. This is the main reason to consider a confirmatory biopsy (time varying between 3 and 12 months) in most AS protocols, which can help identify patients ineligible for AS as a result of disease upgrading. The rate of “reclassification” at confirmatory biopsy varies between 16 and 30%, very similar to the one after prostatectomy.

Due to its great potential, MRI is increasingly used, being able to identify lesions that might be missed by standard biopsy. A positive MRI is associated to higher upgrading rates after prostatectomy and also after confirmatory biopsy. At present, in men on AS, MRI is used as an ally to detect clinically significant disease and help target suspicious lesions; however, there is still no solid evidence to endorse MRI in place of repeated biopsies.

Investigation on genetic/biomolecular/biochemical signatures is urgently needed to better classify our patients, trying to take benefit from non-invasive indicators of progression or reclassification. Research is currently focused on finding genetic signatures of both positive biopsy and adjacent normal tissue/stroma and on studying biomolecular markers possibly present in urine and blood (liquid biopsy). Recently, tests based on high expression of selected genes in biopsy specimens were found to be associated with higher risk of disease progression, but the possible true impact on AS is still to be determined.

AS follow-up plays a crucial role, since it enables to monitor the tumor behavior and potentially detect the more aggressive forms, which may benefit from treatment. In most protocols, follow up is based on clinical data (DRE, PSA and repeat biopsies), some protocols recently including mpMRI. Biomarkers (e.g. PCA3 or -2proPSA) are not routinely used in AS protocols, due to confusing results coming from the literature.

In conclusion, the results of AS programs should be primarily assessed on their ability to avoid overtreatment, while guaranteeing the same curability window of upfront radical treatments. The percentage of patients who remain treatment free is one of these measures, with current estimates being ~40% at 20 years from diagnosis. Evaluation of oncological outcomes such as OS and CSS rates is also important, being in the Canadian AS cohort 62% and 94% at 15 yrs, respectively. Secondary objectives should include quality-of-life and comparison of AS vs radical therapies costs. The variety of inclusion criteria and follow-up protocols makes the evaluation difficult. However, to date, the published outcomes are similar to those in patients receiving immediate curative treatment.

Symposium: Achieving excellence in image guided brachytherapy

SP-0107
Physician training in contouring
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In the past 2-3 decades we have witnessed major advances of radiotherapy planning. These developments were based on implementation of sectional imaging, computerized treatment planning and high precision treatment technologies in the radiotherapy process. When compared with the conventional radiography based method, modern 3-4 dimensional approaches require accurate and reproducible delineation of the target volume and organs at risk on the sectional images of various modalities, including computed tomography, magnetic resonance imaging, positron emission tomography and ultrasound. Contouring variation represents one of the most important contributors to the overall uncertainty in radiotherapy. The dosimetric and clinical benefits of modern high precision radiotherapy can be compromised by inaccurate delineation [Njeh CF. Med Phys 2008]. Assurance of consistent and accurate contouring of the regions of interest is one of the main prerequisites for safe

Contouring training should not be viewed as a process limited to the residency and fellowship programs and core-curriculums. In a study evaluating the impact of prospective contouring rounds in a high volume academic centre, 36 % of cases required modification of contouring or written directives prior to treatment planning [Cox BW, et al. Pract Rad Onc 2015]. In a study of stereotactic body radiotherapy for lung cancer, the institutional peer-reviewers recommended major and minor changes of delineations in 23 % and 37 % of 472 contoured structures, respectively [Lo AC, et al. J Thor Onc 2014]. In view of the rapid developments of imaging and radiotherapy delivery, accompanied by constant evolution and development of new contouring recommendations, the importance of continuous education of the experienced practitioners, mentors and trainers cannot be overemphasized.

Research focusing on site-specific volumetric, topographic and qualitative aspects of contouring variation informs the educational activities in this field. The growing number of published inter-observer studies offers valuable resource to guide the training process. Limiting the learning to didactic and case-based instructions has improved knowledge scores and resident satisfaction in one study. However, this was not translated into improved contouring accuracy [D’Souza L, et al. BMC 2014]. In our experience, site-specific curriculum based on intensive sequence of didactic presentations, system-based instructions and hands-on contouring workshops represents an optimal strategy to achieve good learning results [Segedin B, et al. Submitted to Radiol Oncol 2016]. Feasibility and effectiveness of similar intensive educational interventions has been confirmed by others [Jaswal J, et al. IJROBP 2014]. These favorable early outcomes of teaching cannot be extrapolated on the long-term scale. Further evidence-based characterization of the learning curve is required to quantify the needs for continuous education and identify strategies for long term knowledge consolidation. Relative impact of the individual educational modules and qualifications of trainers on the learning outcome needs to be quantified, taking the tumour-site specific challenges into account. Development of training tools, including e-learning platforms and tools for objective assessment of contouring represent some of the main pre-requisites for future improvements in this field.

SP-0108
Physicist training in 3D dose planning
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New physicists entering in to the speciality of brachytherapy normally undertake a formal training scheme in Medical Physics. Within the specialised field of brachytherapy the depth and breadth of training received can be dependent on the training scheme undertaken, training hospital’s expertise in brachytherapy, length of time dedicated to brachytherapy training and the assessment process. This presentation will summarise the key components of knowledge and experience a physicist should be expected to receive during their brachytherapy training and cross reference this to example training schemes. Several key questions need to be addressed when reviewing the training needs for image guided brachytherapy: Is additional training still required after completion of the formal training scheme? Are they appropriately focussed on image guided brachytherapy?

It is important that any training gaps are identified and that measures are put in place to ensure that physicists have an understanding across all the components of image guided brachytherapy, have a full appreciation of the uncertainties and limitations within the brachytherapy pathway and of the systems used. Additional training resources will likely have to be explored to complement the core training schemes. Examples of available training resources will be presented and how they can potentially help facilitate the training and professional development of brachytherapy physicists.

It is important that we ensure that opportunities for physicist training is not restricted and that physicists are allowed to develop their knowledge, understanding and skill set required for the modern image guided brachytherapy era. Training schemes need to continue to evolve and new training resources explored to complement formal training schemes and work based learning.

SP-0109
New avenues for training with e-learning
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E-learning has the potential to deliver educational content to large numbers of learners world-wide. In 2008, Cook et al from the Mayo Clinic conducted a meta-analysis of 201 studies of e-learning in the health professions. They found that internet-based instruction for medical professionals is associated with favorable outcomes across a wide variety of learners, learning contexts, clinical topics, and learning outcomes. Internet-based instruction appears to have a large effect compared with no intervention and appears to have an effectiveness similar to traditional methods. In a separate review in 2010, they identified that interactivity, practice exercises, repetition, and feedback improved learning outcomes.

This talk discusses the potential of e-learning for teaching competency in target volume delineation (TVD). A crucial component of such a programme is automated assessment of contours with individualised feedback. The talk will compare conventional and novel methods for creating reference contours for TVD assessment, and conventional and novel metrics for automated assessment of TVD competency in individuals and groups of learners. The talk will also discuss the potential to investigate the impact of different instructional designs (e.g. live lectures, podcasts, annotated clinical cases, interactive demos) on TVD competency using quasi-experimental methodology.

Symposium: Imaging markers for response prediction and assessment

SP-0110
Imaging markers for response prediction: the clinical need
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A variety of therapeutic options are now available to cancer patients. It is recognised that significant biologic heterogeneity exists that may affect a patient’s likelihood of response to particular therapies and development of resistance on therapy. To be able to predict whether a patient will respond or not respond to a specific therapy is advantageous in streamlining patient management and minimising the costs of continuing therapy that is not working as well as minimising unwanted side-effects of such therapy.