considered and kept in mind early and during the whole residency. This will not only be of value when applying for a job but will open a number of collaborations as well introducing the trainee in a virtuous circle which will tremendously facilitate future projects, recognition, satisfaction and professional pleasure.

**International exchanges and mobility** are of utmost importance. From personal initiatives directly contacting a department head abroad via email or at a meeting to local/national or scientific societies programs there are many opportunities to gain such an enriching experience. ESTRO for instance supports short terms (few weeks) educational visits called **mobility grants** twice a year which allow for learning a specific technique in the context of a project propose by the candidate through a motivation letter which can be an excellent way to get some connections to look for longer term mobility. Entering a PhD program is another excellent opportunity to access the kind of international exchange and mobility that together with the scientific production and publication resulting from it will serve a career when looking for a position in a high level academic center. Indeed, having an international professional experience and a strong scientific background will be highly considered when applying for a job offer in a university hospital or a cancer center. This will even be almost mandatory when aiming at a research/teaching position.

**Mentorship** can be very helpful throughout a career. Benefiting from privileged dialogue, support and guidance from a more experienced person in the field considered as a mentor can enhance the effectiveness of any talent, help avoiding painful mistakes and optimizing choices that will have a major career impact and sometimes even an impact on the balance between professional and personal life which is often a fragile point in a demanding profession. Many countries across Europe are lacking of mentorship programs but in many institutions even without a dedicated program various types of mentoring are in place. Most of more experienced people are happy to share their experience and give some advices so one should not hesitate to ask for this helpful interaction. With or without a mentor here are key questions that are essential to guide one’s choices: Who am I?

Where do I want to go?

What type of professional activity will I enjoy?

Which life will make me happy?

What type of professional activity will I enjoy?

Which life will make me happy?

To conclude, the best advice would be to always wonder **how to get the most out of one’s training period.** In that aspect, ESTRO offers young professionals in the field of radiation oncology a wealth of opportunities from networking, grants, educational courses, fellowships, mentorships and workshops aiming at refining skills and gaining access to the latest developments in the field that will be of value finishing your residency not only with a job offer but with the job you want.

**SP-0288**

**How to finish your residency / PhD project with a job offer as a radiobiologist**

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PhD training/residency is a long-term and enriching experience, it requires time and commitment for scientific achievement; in addition, the future of a young scientist needs to be planned ahead. Therefore, having a clear view of your career’s perspectives at least 18 months before your defense is the way to professional success. Early during your training discuss your career aspirations and important issues in your professional development with your mentor, he/she will be able to provide you with career information and guidance. But ultimately you will be the one to define if you are seeking for an academic career, job in the industry or other professional options. In any case your mentor will introduce you to colleagues, potential employers, and other professionals who might help to advance your career. You also need to be highly proactive and present your research and creative work as often as possible in multiple forums including your department/university but also at professional conferences/meeting. You will need to apply for fellowships, awards, teaching opportunities and service committees in the scientific community. The aim is to create a strong network that will serve as the base for your job research and will provide you with multiple opportunities.

**SP-0289**

**How to finish your residency / PhD project with a job offer as a physicist**

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**SP-0290**

**How to finish your residency / PhD project with a job offer as a researcher**

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**Symposium with Proffered Papers: Standardisation in clinical practice**

**SP-0291**

**Guideline-based contouring and clinical audit systems**

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Modern radiotherapy techniques focus on the precise irradiation of the target volume while minimizing the dose to adjacent normal tissues. Technical advances at all levels of the complex radiotherapy preparation and delivery process allowed reductions of safety margins and conformations of the high dose volume to the target volume. The introduction of these technical innovations has been supported by extended quality assurance procedures. A small part of the radiotherapy preparation process however has for a long time remained unaddressed: the quality of the delineation is still a weak link in the radiotherapy chain. Accurate, unambiguous and precise target delineation is mandatory in high conformal radiotherapy, since the treatment plan and subsequently treatment delivery are based on the delineated target volumes. Errors in target delineation will on the one hand lead to systematic errors in treatment delivery and possibly to geographical misses in clinical practice. The projected outcome will be undermined both with respect to the chances of tumor control and the risks of side effects. On the other hand, inconsistencies in target volume contouring comprise the validity of the results of clinical trials. To improve the quality of the delineations, guidelines were made for nearly all tumor sites as well as for the normal tissues. Notwithstanding these published guidelines, important inter- and intra-observer variation in target delineation have been demonstrated. Several solutions have been proposed to improve the quality of target delineation: (1) for nearly all tumor sites delineation guidelines with complementary atlases have been published, (2) the registration of CT scans in treatment position with a combination of different imaging modalities has been tested and introduced, (3) automated and semi-automated delineation software has been developed, and (4) education through hands-on workshops at radiotherapy meetings and online tutoring sessions (e.g. FALCON) is available. Studies also show that peer review can improve delineation quality. The quality of target delineation was measured in Belgium through clinical audits for rectal and breast cancer patients. We have evaluated the role of a central review platform in improving uniformity of clinical target volume delineations within a national Belgian project. All 25 Belgian radiation oncology departments were invited to participate in this QA project. CTV delimitation guidelines and atlases were discussed and distributed at a national meeting. After this education of the radiation oncologists, a review process was set up. Departments were asked to delineate the clinical target volumes and to upload it to a secured server. For
rectal cancer, the clinical target volume was delineated and for breast cancer, the regional nodal areas (internal mammary, level I to IV axillary and Rotter space) were contoured. A trained radiation technologist then reviewed all cases according to the guidelines and feedback was given within 24 hours. Twenty-four departments participated to the study and in total more than 2200 contours were reviewed: over 1200 rectal cancer patients and over 1000 breast cancer patients. Evaluation of the contours showed that 74% of rectal cancer cases were modified. These high numbers indicate that the interpretation of guidelines is not always straightforward. More important however is the learning curve that was achieved. The rectal overlap and volumetric parameters significantly increased between the first ten patients per centre and others. The study of the contouring of the locoregional nodal delineation in breast cancer is still ongoing and first results will be presented at presented at the ESTRO 35. For both breast and rectal cancer, some deficiencies in the description of the guidelines were demonstrated, making the interpretation ambiguous, and the guidelines will be adapted accordingly. Within a national QA project, we have shown that clinical audit of target delineation improves the quality of the contouring: the inter-observer variability and the major deviations from the guidelines for rectal cases provide evidence that variability in anatomical contouring contributes to uncertainty in treatment planning and compromises the quality of the treatment plan and delivered treatment. The standardization of tumor and target volume contouring is therefore highly desirable and can be positively influenced by consensus guidelines, education and clinical audits.

SP-0292 Standardisation and treatment planning
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Current plan generation is an iterative trial-and-error procedure in which the planner tries to steer the treatment planning system (TPS) towards an acceptable plan by tweaking of parameters, such as beam angles, goal functions or weights. A plan is generally considered acceptable if it fulfills minimum requirements for tumour and OARs, while significant further improvement of the dose distribution is considered infeasible (within the allotted time). On top of the high workload, the current planning approach leads to suboptimal plan quality: the quality is strongly dependent on the skills and experience of the planner (operator dependence), plan quality is dependent on allotted time, and quality is dependent on subjective preferences and priorities of the planner and the treating physician. Can this variability be reduced? Can treatment planning be standardised? Can we guarantee that each patient will be treated with an individualised, clinically highly favourable (best) treatment plan when generated in an efficient manner? In this presentation, data will be provided demonstrating difficulties that clinicians encounter in evaluating treatment plans. Furthermore, the concept of automated treatment plan generation will be discussed as a procedure that may be used to standardise treatment planning. Examples of the positive impact on plan quality will be presented and consequences for involved personnel and plan quality assurance will be discussed.

SP-0293 Potentials and challenges of automated contouring in treatment planning
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Delineation of targets and normal tissues, typically performed on CT and/or MR images, is still one of the largest sources of variability in radiation therapy treatment plans. In fact, despite well-described guidelines for manual contouring, substantial intra and inter-observer variations exist. Moreover manual contouring is a time consuming process that, depending on the number and complexity of contours to be delineated, can hinder the implementation of adaptive radiotherapy approach. Current perspectives on contouring procedure suggest that an automated approach could reduce both the contouring time and inter-observer variations. Studies evaluating automated contouring in multiple disease sites have in fact demonstrated the potential to improve efficiency and variability associated with manual segmentation. In practice, automated contour are carried out using atlas-based, model-based or hybrid approaches. In atlas-based segmentation the CT scan of a new patient is segmented using segmentations scans of one (single-patient) or more (multi-patient) previously treated patients, called atlases. Methods based on classical deformable models use local image features and automatically adapts the model shape to fit patient’s organ. Various implementations of these two principal methods are described in the literature and are available in commercial contouring software. Prior their clinical use automated contouring methods need an accurate validation. This is a challenging task as medical image segmentation lacks a known gold standard in its real world application. Phantoms as well as synthetic images provide a known ground truth but are an unrealistic surrogate for patient imaging. Moreover, evaluation methods have also lacked consensus as to comparison metrics. A number of different methods have been utilized for comparing segmentation results. The common metrics used fall into one of two categories: volume based or distance based. Each of the comparison metrics has limitations and thus it is desirable to use multiple metrics where possible. This presentation will discuss the advantage in standardization deriving from the use of automatic contouring and the different approach followed in the implementation and validation of automated segmentation tools in different anatomical districts.

SP-0294 Implementation of new standards in your department: a RTT perspective
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Standardisation of clinical practice is essential for the delivery of safe, accurate radiotherapy treatments. Implementation of new standards can be at both local and national levels and examples of these approaches, from an RTT perspective, will be discussed. New standards should be developed and implemented within a multi-professional team setting. Each profession has a role to play and bring different perspectives to the development and implementation process. Development of training and competency assessments for the use of new delivery techniques are an essential aspect of implementing any new standards. These assessments can be established locally using national guidelines. For example the UK National Radiotherapy Implementation Group IGRT recommendations¹ which was written by a multi-profession team to assist centres in utilising IGRT equipment and details content for IGRT training and competency assessment programmes. This recommendation document has been instrumental in the UK with ensure appropriate utilisation of IGRT for each anatomical site and ensuring quality IGRT is delivered to patients. RTTs are also involved in the preparation of national SABR guidelines, as part of the UK SABR consortium, particularly focusing on the treatment delivery and IGRT sections. Clinical trials provide a controlled environment where new standards can be developed in a quality assured way. A UK prostate radiotherapy clinical trial utilised both IMRT and IGRT within the context of a study evaluating a number of fractionation schedules. This assisted the centres involved in the development of IMRT and IGRT standards within their departments within a quality assured clinical trial. RTTs were able to use IGRT processes clearly defined within the protocol and the support of the QA team for the trial were available for advice