technique is regarded as the most accurate calculation method in the dose calculations for kV beams. The Monte Carlo user code, BEAMnrc/DOSXYZnrc was used to simulate x-ray sources. The detailed x-ray tube geometry was simulated, including the anode x-ray tube specifications, target design, beam definition, beam filtration systems, and incident electron energy. Each simulated realistic kV beam with respect of an image acquisition procedure was stored in a phase-space file. The simulated beam specific to an image procedure was individually calibrated by using anl ion chamber in which the air kerma calibration factor is traceable to national standards. When a Monte Carlo simulated beam is calibrated it allows the user to calculate both relative and absolute absorbed doses to patients. Patient dose calculations were done using the Monte Carlo generated kV beam as an incident beam on patient CT based images. The dose resulting from a radiograph image procedure was calculated by incident the source from a fixed incident angle (AP, RL, etc.) while the dose resulting from a kV-CBCT scan was calculated by rotating the X-ray source around the patient based on the specific scan procedure.

Results: The Monte Carlo simulation provides realistic beam details such as energy spectra, particle fluence, and the mean energy distributions. The simulation accuracy was validated by benchmarking the Monte Carlo simulations against measurements of the beam's half-value layers and dose distributions. Patient dose calculations showed that the imaging doses to the eyes for representative head images are 0.05-0.2 cGy and 0.1 cGy; doses to the bladder for representative pelvis images are 1.6 cGy and 0.07 cGy; while doses to the heart for representative thorax images are 0.4 cGy and 0.07 cGy; when using kV-CBCT scans and kV radiographs, respectively. In contrast, organ doses increase by a factor of 2-4 if bow-tie filters are not used during kV-CBCT acquisitions.

Conclusion: The excellent agreement between Monte Carlo calculations and measurements demonstrates that Monte Carlo techniques yield accurate results for kV dose calculations. Current on-board kV imaging devices result in much lower imaging doses compared to the conventional MV portal imagers. There are a variety of approaches available to significantly reduce the image doses. It is feasible to estimate and account for organ dose by using tabulated values based on scan procedure and site because organ doses from imaging procedures are only modestly dependent upon scan location and body size.

Symposium: Innovations in functional imaging for radiotherapy

SP-0602

PSMA ligands for diagnosis and therapy

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Since the prostate-specific membrane antigen (PSMA) is frequently over-expressed in prostate cancer (PCa) several PSMA-targeting molecules are under development to detect and treat metastatic castration resistant prostate cancer.

In 82.8% of 319 patients investigated with ^{68}Ga-PSMA^{HBED}-PET/CT at least one lesion indicative for PCa was detected. Tumor detection was positively associated with PSA level and androgen deprivation therapy. Amongst lesions investigated by histology, 30 were false-negative in ^{68}Ga-PSMA^{HBED}-PET/CT (one local relapse in one patient and 29 lymph nodes in another patient), all other lesions (n=416) were diagnosed true-positive or -negative. Fifty of 116 patients available for follow-up received local therapy after ^{68}Ga-PSMA^{HBED}-PET/CT.

A comparison of ^{68}Ga-PSMA-ligand with ^{18}F-fluoromethylcholine PET/CT revealed 78 PC-suspicious lesions in 32 patients using ^{68}Ga-PSMA-PET/CT and 56 lesions in 26 patients using Choline-PET/CT. The higher detection rate in ^{68}Ga-PSMA-PET/CT concerning PC-suspicious lesions was significant (p=0.04). All lesions detected by ^{18}F-fluoromethylcholine-PET/CT were also seen by ^{68}Ga-PSMA-PET/CT. In ^{68}Ga-PSMA-PET/CT SUV_{max} was clearly (>10%) higher in 62 of 78 lesions (79.1%) and tumor-to-background ratio was clearly (>10%) higher in 73 of 78 lesions (93.6%) when compared to ^{18}F-fluoromethylcholine-PET/CT.

Since the ligand bound to PSMA is internalized, the target may also be used for endoradiotherapy. We used a small molecule inhibitor of PSMA ((*S*)-2-(3-((*S*)-1-carboxy-5-(3-(4-[^{131}I]-iodophenyl)ureido)-pentyl)ureido)-pentanedioic-acid; MIP-1095) for therapy in men with mCRPC. Dosimetry estimates for I-131-MIP-1095 revealed that the highest absorbed doses were delivered to the salivary glands (3.8 mSv/MBq, liver (1.7 mSv/MBq) and kidneys (1.4 mSv/MBq). The absorbed dose calculated for the red marrow was 0.37 mSv/MBq. PSA values decreased by >50% in 60.7% of the men treated. 84.6 % of men with bone pain showed complete or moderate reduction in pain. Hematological toxicities were mild. 25% of men treated had a transient slight to moderate dry mouth. No adverse effects on renal function were observed.

In order to increase the therapeutic flexibilty we designed a novel theranostic PSMA ligand coupled to DOTA which allows coupling to Ga-68 for diagnostic use or to Lu-177 or Ac-225 for therapy. Especially for alpha therapy with Ac-225 promising results were found in the first 10 patients.

SP-0603

MR spectroscopic imaging at high field for tumour characterisation

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Abstract not received.

SP-0604

A visual computing approach towards integration of multi-parametric imaging into radiation oncology workflows

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The integration of the full analytical power of today's multi-modal and multi-parametric imaging techniques into workflows of radiation oncology has not yet reached daily clinical routine. Reasons for this are manifold and range from simple data integration problems to the question, how the relevant information distributed over different images or over several parameters can be fused in the best way to provide a more complete and comprehensive image of the current situation.

The EU project Software for the Use of Multi-Modality images in External Radiotherapy – SUMMER(*) is addressing these problems with the aim to extend the current set of imaging modalities integrated into radiotherapy planning. In this talk, I will give an overview over faced challenges and results achieved over the last 3 years from a Visual Computing perspective. I will show how visualization, data fusion, and alternative ways in data representation can be used to gain

new insights and significantly accelerate current workflows. Special emphasis will be given on use cases including 4D PET/CT and MR Spectroscopy data - work we have done in cooperation with the University Hospital Freiburg and the Institute Claudius Regaud in Toulouse.
(*) http://summer-project.eu/about-summer/

Symposium: How does the RTT world look in 2020? Different regions, different challenges

SP-0605
RTT perspective in Eastern Europe and region of Former Yugoslavia on basic of education an roles
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Purpose and Objective: Basic on receive and available data of RTT education,position, roles and titles recognized in Eastren Europe situation is more and less is almost same, in field of basic education, titles recognized, individualizm in work, research possibilities.
Last couple years more of countries start with application of Bologna system and improve the educational system in proffesionall studies through proffesional schools , course three years, or establish Faculty for Health Studies with possibillities for Masters postgraduates studies.But Radiotherapy still not recognized in field of speciallization or Masters postgraduate studies.
RTT titles is still not recognized in more countries and is very difficult to explain – we are not same!! Even in Serbia where exist professional Societies , who is registered in goverment and recognized from National chamber, is almost inmpossible to put RTT titles in regulatory titles description.
Main problem still is title recognized and failure to recognized in individualizm RTT work in main RTT skills, without pssibilities for reserach field of RTT.
Materials and Methods: For improving and accetablle vision of RTT in 2020 must exist good project and cooperation beetwen RTT in Eastern Europe. One of good project in educations of RTT is ESTRO/IAEA project TTT. Through this project the RTT from region of Former Yugoslavia establish excelent cooperation in field of continual education and position of RTT. The members of first TTT group from this country actively participate in creating of education of RTT on schhol, chambers and proffesional Societies. Also , through project was made excellent connection between participants .
Finaly the IAEA conference in Vienna in Decembar 2013. With topic about curent situation and way forward , which included lecturers from basic studies near the liders of National Societies, is good movement for future improvement.
Results: This cooperation through TTT project is get result in good position in international organization, possibilities to create one small part of education, and create documents about workflow and competentions for RTT in some country.
In front of them is a responsible and difficult task to establish same quality education in basic studies like in they made in continual education. First of all to establish specialization and Masters studies for RTT in field of basic skils of RTT over Core Curiculla and one new specialization RTT Dosimetrist, who would be responsible for contouring and QA.Recognized of titles and position of RTT must provide more idividualizm in RTT works.
Conclusions: In next period the goal is

1. provide more time for Radiotherapy subject through studies
2. specialization and Masters studies in Radiotherapy
3. RTT Dosimetrist like new skills of RTT in field of contouring OAR and QA
4. Provide more individualizm in RTT work
5. Provide possibility of research for RTT
6. Cooperation beetwen proffesional Societies of Eastern Europe through board within ESTRO.

In 2020 RTT in Eastern Europe will be technicians with proffessional or faculty degree, absolutely indepence in work with whole liability for own work with possibilites for research activities through its work. RTT will be RT Dosimetris specialist with Masters degree or specialization, and RTT from Esatren Europe will will share they knowledges through Associations. This idea is feasible.

SP-0606
Vision 2020: Challenges facing the RTT in Western Europe
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It is undoubtedly an exciting but challenging time to be an RTT in Western Europe. With the ever-expanding technological advancements in radiotherapy and the drive towards personalised radiotherapy for individual patients, RTTs in Western Europe must be equipped to meet these challenges.
One such challenge is in relation to the definition of roles and responsibilities of the RTT and there is a wide variety in this at present across Western Europe. In some countries, the profile of the RTT is well defined, particularly with respect to research, treatment planning and dosimetry, image-guidance, clinical decision-making, ongoing care and advice throughout the process and psychosocial support whereas in others, it is less so.
This discrepancy can be closely related to the inherent differences in RTT undergraduate education across Western Europe, with dedicated radiotherapy programmes in some countries and 'mixed' education programmes in others.
Definition of and discrimination between standard roles, role expansion and advanced practice is also challenging in Western Europe as we approach 2020 and is somewhat ambiguous. The essential competences of any graduate should be addressed through the undergraduate programme and such progression in roles and responsibilities should be closely linked to postgraduate education level.
Personalised treatment is the future of radiotherapy within Western Europe in the next five years and this will challenge the RTT to examine their practice in a new fashion; moving from generic 'site-based' solutions to an individualised and holistic interpretation of the management and care of patients.

SP-0607
India How does the RTT world look in 2020? Different regions, different challenges
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"Emerging country like India are the fastest growing with the greatest needs for fast and efficient technologies to treat growing cancer populations" We want to make sure that what we develop and produce meets their needs. focused on learning about the clinical processes that are followed in