Conclusions: Individualized oncology will *revolutionize* health care providers: it will increase the complexity of health care but not necessarily increase the costs and it will improve the therapeutic ratio of our treatments through a better use of the existing knowledge. We anticipate that Decision Support Systems will.be the cornerstone of this revolution. Voxel Control/Complication Probability will give new opportunities to modern high precision radiation oncology. It will allow sculpting radiation dose alone or combined with drugs by taking advantage of tumour and normal tissue heterogeneity. In short, *both intra and interpatient heterogeneity give* new opportunities to improve our treatments

16 INVITED

Educating RTTS – a European adventure

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Background: The word education comes from the Latin *e-ducere* to lead out. Socrates saw education as drawing out what was already within the student. Education is a collaborative enabling process between the teacher and the student to stimulate a continuously enquiring mind. Essentially we fail if our students do not ultimately know or are not able to do and achieve more than we have.
Education should be an equaliser bringing professional freedom and autonomy. The education level of RTTs impacts on professional practice, multidisciplinary relationships and ultimately the preparation and delivery of optimum treatment to our patients. The theme of this presentation is on the efforts that have been made to improve education in order to enable RTTs to achieve autonomy and greater professionalism.
Education programmes for RTTs vary very significantly across the world, ranging from no specific education to an honours degree. This variation is also reflected in the lack of a unified title with as many as 50 different titles for this professional group. The variation in title has many implications for education and practice and results in a lack of recognition of the RTT internationally.
Over a twenty year period, I have developed the radiation therapy honours BSc programme in Trinity College Dublin and been involved in education initiatives such as the European Core Curriculum for RTTs, organising biannual conferences in conjunction with the main ESTRO Conference and the Physics meeting, developing and facilitating short courses and the final, and most exciting to date, the Train the Trainers project.
Train the Trainers: Twenty three participants, representing eight countries, were accepted onto the Train the Trainers project. The participants spent one week in Vienna in August 2008 where they were assisted by the teaching faculty to prepare an outline of a short course on a subject of their choice to deliver to a local audience of RTTs in their own country. Issues relating to the practical organisation of the short course were also considered. Each group committed to delivering three short courses over a two year period and to consider how the topic chosen could then be integrated into their national education programme.
Seven of the participating countries succeeded in preparing and delivering a short course. The topics covered a wide range of areas relevant to the local situation. Several of the countries attended each others courses and are making plans to share further short courses in the future. A feedback session is scheduled for August 2009 when each group will share their experience and discuss how they will now proceed.
During this presentation I will describe my experiences both nationally and internationally in raising the education level and professional profile of RTTs and how this work might be continued in the future.

17 Emmanuel van der Schueren Award

PET-CT imaging in radiation oncology

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Positron emission tomography (PET) with fluorodeoxyglucose (FDG) is a useful imaging tool in the management of cancer patients. The potential gains of integrated PETCT imaging are progressively being recognized. FDG-PET is able to measure and visualize metabolic changes in cancer cells. This feature results in the ability to distinguish viable tumor from scar tissue, in the detection of tumor foci at an earlier stage than possible by conventional anatomic imaging and in the measurement of alterations in tumor metabolism, indicative of tumor response to therapy. PET provides biological tumor information complementary to anatomical imaging by CT or MRI. Integrated PET-CT has found its way into clinical practice and FDG-PET is being introduced for staging, detection of recurrences, radiation treatment planning and therapy response monitoring and prediction. In addition to FDG, other PET tracers are available for imaging specific biological tumor characteristics involved in radiation resistance, such as hypoxia and proliferation.
Notwithstanding the potential of PET-CT, a critical appraisal of the current clinical state-of-the-art and the experimental application of this novel modality is necessary to allow timely implementation of clinical trials in daily patient care, but also to avoid overutilization.

18 INVITED

Combining EGFR inhibitors with radiation

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The incorporation of molecular targeted therapies into modern cancer treatment regimens is relatively recent, reflecting several decades of molecular biology coming to fruition in the form of new anti-cancer drugs. The EGFR inhibitors are one class of highly promising agents in this arena. Thousands of cancer patients are currently receiving EGFR inhibitors and a broad series of clinical trials that incorporate these agents are in progress. Combining EGFR inhibitors with radiation has shown particular promise for patients with cancers of the H&N. Indeed, the first Phase III clinical trial to identify a survival advantage when combining a molecular targeting agent (anti-EGFR) with radiation emerged fairly recently in H&N cancer (NEJM 354:567−78, 2006).
Accompanying the promising clinical development of EGFR inhibitors in cancer therapy are several challenges. For example, molecular strategies of EGFR inhibition demonstrate major tumor regression in approximately 10−20% of cancer patients. However, many tumors do not show response to EGFR inhibition and some responders eventually manifest resistance to treatment. The underlying mechanisms of intrinsic and acquired resistance to EGFR inhibitors remain largely unexplored. Although the toxicity profiles for EGFR inhibitors do appear milder than that of conventional cytotoxic chemotherapy agents, the unique toxicities of EGFR agents are nonetheless important to recognize and treat appropriately. Finally, many of the new molecular targeted therapies (including EGFR inhibitors) are remarkably expensive. This high cost reflects the manner in which new drugs are discovered, developed and promoted in the current era, and this feature carries implications regarding the broad availability of these new cancer drugs in the future.
The logical integration of basic science with clinical research will further define the spectrum of benefits and toxicities associated with each new cancer therapy. This is certainly true for the combination of EGFR inhibitors with radiation (or chemoradiation); an area that is advancing, but still at a relatively early stage of overall development. As with all treatment advances, it is valuable for oncologists to remain actively engaged in evaluating the rational and judicious application of each new treatment approach.

19 INVITED

Identification of gene variants and gene expression profiles predicting long term adverse side effects of radiation treatment in breast cancer patients

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In breast cancer (BC) patients with regional lymph node metastases loco-regional radiotherapy (RT) is an established adjuvant treatment. Improved detection and early diagnosis are likely to increase the importance of loco-regional control and hence the success of RT. Radiation oncologists have for a long time known that individuals respond differently to radiation. In addition to the variation in tumour response, some patients show severe side effects when exposed to small doses of radiation, while others tolerate larger doses without much complication. To be able to protect radiation sensitive (RS) patients against the adverse side effects of RT, identification of such patients before initiating therapy is needed. RT kills cells unselectively and irradiation of normal tissue may cause severe side effects that appear at different time points. Acute side effects may emerge during or shortly after a course of RT and these early reactions condition for many BC survivors, leading to a reduction in quality of life. To explore the underlying cause of radiation sensitivity we have taken several approaches. Germline variation in genes like *ATM, CHK2*, *BRCA1/2* and *GSTs* are studied in several series like the WECARE (Women's Environment Cancer and Radiation Exposure) involving 700 cases with contra lateral BC and 1400 matched unilateral BC with detailed information about radiation treatment, and in a series of 245 receiving a high dose of radiation compared to a control series receiving standard dose, both extensively evaluated for radiation damage 10 – 15 years after treatment. These studies are ongoing and updated results will be reported.
Gene expression profiling of fibroblasts exposed to radiation form BC patients previously treated with IR and evaluated for response and morbidity identified a set of genes involved in extracellular matrix to predict fibrosis.