SP-0347
The need and potential for use of big data for research and development of radiotherapy
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Abstract text
Radiation oncology is an area of medicine that stands to benefit enormously from clinical knowledge extracted from "big data". Radiotherapy departments worldwide generate a vast quantity and variety of data daily, due to the extensive use of medical imaging and a relative high degree of process automation already in place. It is important to understand the scope, type, quality and distribution of variegated oncology data if we wish to extract knowledge using machine learning and artificial intelligence. The potential benefits that can be addressed through utilization of big data approaches in healthcare generally fall into two domains – operational improvements and direct patient benefit. Among the major clinical needs in radiation oncology are : appropriate patient stratification, optimal treatment selection and reducing unjustified variation in procedures. Operational excellence, such as automating routine steps in clinical workflow, are more easily introduced into clinical practice but tend to have limited or indirect patient impact. Prediction of prognosis and treatment outcome (hence exerting direct influence on clinicians' decision making) is much more cautiously being introduced into the clinic, but has immense future potential for substantial patient benefit. There are still major challenges impeding research and clinical utilization, chiefly focussed around issues of consent, privacy, generalizability and quality assurance.

SP-0348 Challenges of collection, sharing and analysis of data at scale
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Abstract not received

SP-0349 Practicalities and issues of setting up the infrastructure to collect big data in a hospital environment
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Abstract text
Recent years have seen increased interest in the clinical value of routinely collected patient data. The migration to electronic patient record systems coupled with the increased ease with which powerful machine learning techniques can be employed has led to huge growth in the volume of retrospective observational studies reported in the radiation oncology literature. High quality studies can provide valuable insight where gold standard randomized trial evidence is lacking or where traditional methodologies are not appropriate.
The Christie NHS Foundation Trust in partnership with the Manchester Cancer Research Centre has invested significant effort in establishing an informatics infrastructure to enable such studies. Use of the system has underpinned a rapid expansion in the volume of related research within the institutes and streamlined collaboration with international partners. In this talk we describe the practicalities of implementing this system, focusing on the organizational, resource and governance aspects as well as the technical detail. We explore both the barriers overcome and the remaining challenges, and consider, with examples and case studies, how the system fits into both the academic and clinical aspirations of the host institutions.

Symposium: From grid therapy to microbeam radiotherapy

SP-0350 Introduction to microbeam radiation therapy: radiosurgical grid therapy at the microscopic scale
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Abstract text
Microbeam radiation therapy (MRT) is a still experimental concept of spatially fractionated radiotherapy. Clinically, it compares closets to radiosurgery and grid radiotherapy. In MRT, the irradiation target is covered by an array of quasi parallel microbeams. Microbeams are typically between 25 and 100 µm wide and spaced at center-to-center distances of several hundred micrometers. Thus, an inhomogeneous dose distribution with characteristic peak dose (high dose) and valley dose (low dose) zones is generated. The X-ray doses deposited in the peak dose zones are typically in the order of several hundred Gy. It has been shown in small animal models of malignant brain tumour that MRT allows a superior tumour control compared to current clinical radiotherapy concepts. The original concept of MRT has been developed in the 1980s by a group of researchers at the NSLS (synchrotron radiation source at Brookhaven, USA) with the experiences of classic clinical grid radiotherapy in mind. Since then, an increasing number of research groups has expanded the field to understand the therapeutic potential of MRT. Different irradiation schedules were tested, with MRT as single fraction treatment similar to clinical radiosurgery or with MRT integrated in a conventional radiotherapy schedule. Studies were designed to assess the tolerance of normal tissue and the potential adverse effects of MRT. During the first decade, MRT research focused mainly on brain tumours as target indications. More recently, there have been interesting developments within the MRT research community to include other tumour entities as possible targets, such as malignant melanoma and carcinoma of the lung.
This presentation will highlight key achievements of MRT research in preparation of its transition from bench to bedside.

SP-0351 Spatial fractionation of the dose: from photons to charged particles
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Abstract text
The therapeutic use of ionizing radiation has been largely guided by the goal of directly eliminating all cancer cells while minimizing the toxicity to adjacent tissues. Nowadays, technological advances in radiation delivery, including image guidance and particle therapy (i.e. proton therapy), have notably improved tumor dose conformation, thus reducing the dose to the organs-at-risk. Despite remarkable advancements, the dose tolerances of normal tissues continue to be the main limitation in RT and still compromise the treatment of some radioresistant tumors, tumors close to a sensitive