epidemiological study, and will be used to test the validity of a predictive risk model based on values of neutron RBE which will be derived from the physics task in the ANDANTE project. Based on the experience from the feasibility study at LLUMC, a proposal for a prospective epidemiological study using pediatric proton therapy data collected from multiple proton centers world-wide is prepared. For this purpose, published results of epidemiological studies on second malignant neoplasms (SMN) after radiotherapy in childhood are reviewed. Up to now, 57 papers were identified from 2001 until present with the objective to estimate the magnitude of the effect of radiation exposure on the occurrence of SMN. Furthermore, European proton therapy centers were contacted in order to assess the feasibility of creating a prospective database on pediatric patients. Five out of thirteen proton therapy centers already replied, showing great interest in preliminary participation in discussion on forming a future prospective study.

Conclusion: This will be essential for investigating the far reaching goal to enhance our understanding of the link between radiation exposure to proton therapy and the risk of SMNs.

EP-1418
Proton therapy in paediatric oncology - An Irish perspective
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Purpose or Objective: To: (1) produce a descriptive study of Irish children referred abroad for proton therapy (PT), and (2) to discuss the case for PT in general.

Material and Methods: A retrospective review of all children referred for PT before October 2015 was performed. Information was gathered regarding general demographics, diagnosis, tumour grade, other treatments, the PT referral timeline, relapse where relevant, side effects attributable to PT, current status and cost of treatment to the Irish state. Additionally, a review of the relevant literature was performed.

Results: Sixteen children treated in Ireland have been referred abroad for PT to date, with numbers increasing yearly. The largest number referred was in the 0-4 year old group. At initial diagnosis the median age was 5.0 years. Four patients were referred for treatment of rhabdomyosarcoma, 3 for cranialpharyngioma, 6 for intracranial ependymoma and 1 each for treatment of meningioma, germinoma and ATRT. The average cost per child has been approximately €52,000. Two patients suffered relapse of their disease - 1 has proven fatal and the other is alive with disease. Four patients have encountered PT-related adverse effects. The time from referral to treatment has improved from 11 to 6 weeks approx.

Conclusion: Despite the fact that >100,000 patients worldwide have been treated with PT, the current level of published evidence to support superiority over conventional treatment remains low. Planning studies have clearly demonstrated superior conformity and reduced risk to normal tissues. It is debated that randomised control trials in this area would be inconsistent with the principle of clinical equipoise. In contrast, there is a call for level 1 evidence to justify such drastic changes in patient care, particularly in the light of recent reports of unexpected toxicities. If PT were more widely available, the question remains in which clinical situations would it be likely to show substantial clinical and cost benefit? No firm conclusions can be derived from the literature, the answer is somewhat speculative. In time, careful evaluation, follow-up and clinical trials will likely support the argument for the preferential use of proton therapy in children. Our challenge remains: how best to use it in the meantime?

EP-1419
Proton irradiation in childhood and adolescence at RINECKER Proton Therapy Center (RPTC)
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Purpose or Objective: In the multimodal treatment concept for pediatric tumors the implementation of radiotherapy with protons gains more and more importance due to their outstanding radiobiological, physical and technical characteristics. In particular the fact, that about 60% of the irradiated volume of conventional radiotherapy are not burdened by proton therapy, results in a considerable reduced incidence of side effects with lowering the negative impact on growth and development and a lower rate of secondary malignancies. The German Society for Radiation Oncology (DEGRO) clearly recommends preferably proton therapy in the treatment of pediatric patients.

Material and Methods: Analysis of children and adolescents undergoing proton radiation therapy since start of the RPTC 2009 (time period from Jun 2009 to Sep 2015). A highly complex three-dimensional electromagnetic proton beam control system (spot scanning) can applies the tumor dose only to the planned target volume and spares surrounding healthy tissue without significant neutron exposure to the whole body. There is a wide range of free variety of dose intensity to each spot.

Results: From 06/2009 to 07/2015 a total of 82 patients were previously treated at the RPTC in 88 cases. The mean age at start of irradiation was arithmetically 7.9 years (min. 11mo.; max. 17 y. 7mo.). These were mostly rhabdomyosarcomas (RMS; n = 26 [29.5%]), of which 10 were alveolar and 16 were embryonal RMS. In the field of central nervous system, 14 patients had low grade gliomas [16%], 11 high grade gliomas [12.5%], 10 ependymomas [11%] and 2 medulloblastomas were treated. From 12 cases with rare tumor types, 8 were also localized in the CNS. 6 patients had chordoma and chondrosarcoma, 5 Ewing tumors and 2 rare types of soft tissue sarcomas.

Conclusion: At the field of pediatric oncology radiotherapy with protons using spot scanning technology is certainly feasible and a highly effective treatment method with significantly lower toxicity of normal tissue. There is a close cooperation with the Children’s Hospital of the Municipal Hospital Munich/ Hospital of Munich Technical University for the integration of multimodal therapy studies or to treat in analogy with rule-based case discussions in interdisciplinary tumor conferences.

EP-1420
Cyberknife® radiotherapy for recurrent or oligometastatic tumours in children and adolescents
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Purpose or Objective: Despite the increasing availability of stereotactic ablative body radiotherapy (SABR) and stereotactic radiosurgery (SRS) there remains a lack of evidence regarding their indications and role in the treatment of recurrent & oligo-metastatic tumours in children, teenagers & young adults (TYA).

Material and Methods: A retrospective review of paediatric and TYA patients (age ≤24 years) treated with SRS or SABR at The Royal Marsden Hospital from 2010 to 2015 was
performed. Data collected included: tumour type, technique, dose, number of fractions, prescription isodose, acute and late toxicity (CTCAE v4.0), local control (LC) and progression free survival (PFS).

Results: 12 patients were identified: 8 males and 4 females; median age 14.5 years [5-20 years]. Cranial SRS was delivered to 9 sites in 7 patients, and extracranial SABR was delivered to 8 sites in 5 patients. All patients had a Lansky/ Karnofsky score ≥70. All SABR and SRS treatments were performed using the Cyberknife® platform; 8 treatments prescribed as a single fraction (median dose 19 [18-24] Gy), 4 treatments were given in 3 fractions (median dose 28.5 [27-42]Gy) and 5 treatments in 5 fractions (median dose 30 [30-35]Gy). The median prescribing isodose was 79% [70-81%]. For 5 patients SRS was delivered post surgical resection with no macroscopical residual disease at the time of treatment. The treatment for 9 (75%) patients was to previously irradiated sites. After a median follow up of 14.5 [0.9-36.2] months 9 pts (75%) were alive, 2 died from disease progression and 1 died from unclear cause. MRI response assessment was performed at a mean time of 6 [3-17] weeks; 1 patient had a complete response, 10 had stable disease (83 %); 1 was not assessed due to a rapid clinical deterioration. LC was 100 % and 85.7% at 1 and 2 years respectively. PFS was 82.5% at 1 year and 61.9 % at 2 years. 3 reirradiated patients reported symptomatic grade 3 radionecrosis, requiring medical therapy.

Conclusion: In this cohort, SABR and SRS with Cyberknife® have proven feasible in the subset of paediatric & TYA patients with recurrent or oligo-metastatic tumours. It achieved good local control even in pre -irradiated patients. However optimal patient selection for such a treatment approach remains as yet to be determined via an international consensus.

EP-1421
Radiotherapy for pediatric patients from 2006 to 2015 in a large health care region
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Purpose or Objective: Particle therapy is not available in our country yet, however, quite a few patients are sent abroad for such therapy. In the largest health trust, covering a population of 2.9 million, 25-40 pediatric patients (< 18 years) are treated with radiotherapy (RT) yearly. We wanted to analyze this group of patient with respect to RT technique and diagnosis.

Material and Methods: All pediatric patients treated between January 2006 and June 2015 were identified and included. The treatment techniques were categorized as follows: total body irradiation (TBI), whole CNS RT, IMRT/VMAT, stereotactic RT (SRT), 3D conformal RT (CRT), kV RT and extracorporeal irradiation (ExCRT). Additionally, the pediatric patients referred for proton RT abroad were registered.

Results: 302 pediatric patients were treated with RT in the period. The mean age at treatment were 11.3 ± 4.6 years. 69 patients (25%) had brain tumors, whereas 50 (18%) and 43 (16%) patients were diagnosed with lymphoma and leukemia, respectively.

The figure gives the distribution of the treatment techniques throughout the whole period (upper panel), showing that more than 50 % of the patients have been treated with CRT. The lower panel in the figure shows the distribution in 2006 (left) and 2014 (right), indicating that the proportion of patients receiving CRT has decreased from 50 to 38 %. However, the number of patients only reduced from 18 in 2006 to 15 in 2014. The number of patients treated with advanced techniques (IMRT/VMAT, SRT) did not change significantly. On the other hand, 20 % of the patients were referred for proton RT abroad in 2014, while no one received such treatment in 2006. The number of patients where the whole CNS were treated reduced from 8 (25%) in 2006 to 3 (8%) in 2014.

In the whole period 31 patients (10%) were treated with TBI and the number of patients per year did not change significantly from 2006 to 2014.

Conclusion: An official agreement was established with proton centers abroad in 2013. The reduction in whole CNS treatment throughout the period is due to this agreement. Except TBI, kV RT and ExCRT, all the other techniques should be replaced with proton RT when such treatment becomes available.

EP-1422
Contemporary management of bone metastases from breast cancer: Who is getting long course RT?
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Purpose or Objective: The Norwegian Breast Cancer Group provides national guidelines regarding systemic therapy for metastatic breast cancer. While our center adheres to these recommendations, use of palliative radiotherapy (PRT) for bone metastases is less standardized. Despite general recommendations, use of palliative radiotherapy (PRT) for bone metastases is less standardized. Despite general recommendations for short course PRT for uncomplicated metastases, many physicians prefer 40 fractions (long course, LC). Our aim was to analyze factors associated with prescription of ≥10 fractions.

Material and Methods: This retrospective study included 118 female patients (all received systemic therapy including bone-targeting agents in accordance with national guidelines).

Results: Median age was 61 years, and median survival 13 months. Long-course PRT was prescribed in 60% of patients, while 21% had PRT with 8 Gy single fraction to at least one target. Reirradiation rate was numerically higher after 8 Gy (9%, compared to 5% after LC PRT and 6% after 4 Gy x5, not significant). Patients with favorable baseline characteristics were significantly more likely to receive LC PRT. These characteristics included absence of lung metastases and/or...