

## AbstractID: 4455 Title: Understanding Pediatric Radiation Therapy

Most Medical Physicists working in radiotherapy departments see few pediatric patients. This is because, fortunately, children get cancer at a rate about 30 times smaller than adults. Children have not smoked, abused alcohol, or been exposed to environmental carcinogens for decades, and of course, have not fallen victim to the aging process. Children get very different cancers than adults. Breast or prostate cancers, typical in adults, are rarely seen in children but instead a variety of tumors occur in children that are rarely seen in adults; examples are germinomas, ependymomas and primitive neuroectodermal tumors, which require treatment of the child's brain or neuroblastoma, requiring treatment in the abdomen. The treatment of children with cancer using radiation therapy is one of the most challenging planning and delivery problems facing the physicist. This is because bones, brain, breast tissue, and other organs are more sensitive in children than in adults while the required tumor dose is frequently above 50 Gy. Because most therapy departments treat mostly adults, when the rare 8 year-old patient comes to the department for treatment, the physicist may not understand the clinical issues of his disease which drive the planning and delivery decisions. There is a new set of dose constraints different from the adult patient, which, depending on the site of treatment, may require changing the routine beam arrangement for that site. Additionally, children are more prone than adults to developing secondary cancers after radiation. This fact has important implications for the choice of delivery techniques, especially when considering IMRT. For bilateral retinoblastoma, an irradiated child has a 50% chance of developing a second cancer by age 50.

In this presentation, an overview of childhood cancers and their corresponding treatment techniques will be given. These can be some of the most complex treatments that are delivered in the radiation therapy department. These cancers include Leukemia treated with total body irradiation, medulloblastoma, treated with craniospinal irradiation plus a conformal boost to the posterior fossa, neuroblastoma, requiring focal abdominal irradiation to avoid kidney, liver, and vertebral body damage, retinoblastoma, requiring treatment to an eye while minimizing dose to surrounding tissues, and a variety of other tumors which occur anywhere in the body. Case studies will be presented showing the treatment technique and resulting dosimetry, highlighting the objectives for tumor coverage and organ-at-risk sparing. Practical issues that have to be faced when treating children will also be discussed such as daily sedation and immobilization.

Finally, most children with cancer are treated within a clinical trial administered by the Children's Oncology Group. Examples of the protocol physics requirements will be discussed as well as the physicist's responsibility for providing data to the Quality Assurance Review Center.

The presenter is Chief of Physics at one of only two radiotherapy departments in the country that treat exclusively children (Children's Hospital Los Angeles).

### Objectives:

- 1) Improve understanding about childhood cancer and treatment with radiation
- 2) Understand treatment planning and delivery issues specific to children
- 3) Understand physicist responsibility for clinical trial participation