Title | Childhood Cancers: The path to precision medicine
Course Directors | Drs. Pratiti (Mimi) Bandopadhayay, MBBS PhD and Tab Cooney, MD
Curriculum Fellow | Jelena Patrnogić, PhD

Overall Course Objectives

1. Understand the differences in biology between pediatric and adult cancers, including the interplay with development
2. Identify the unique translational and clinical trial development challenges associated with targeted therapies for childhood cancers
3. Demonstrate the principals behind sequencing and trial design for precision medicine against childhood cancers
4. Recognize the individual, familial, and societal late effects of childhood cancer survivorship

Overall Description

Pediatric cancers are the leading cause of disease related death in childhood. Children that do survive are frequently left with devastating and life-long morbidity from the treatments required to cure them. The last two decades have shed tremendous insights into the drivers of these cancers, providing optimism that precision medicine approaches may lead to more effective treatments.

In this course, we will review the genetic drivers of childhood cancers and the mechanisms through which they drive tumor formation, in the context of normal childhood development. We will review the principles that underlie the design of clinical assays that can be used to profile tumors and the path through which translational discoveries can be evaluated in clinical trials. The course will provide an overview of current childhood cancer treatment strategies and their associated long-term effects. Finally, we will host a family who have faced the diagnosis of a cancer in their child, to learn from the patient's perspective.

Sessions will include review of literature and datasets, group discussions and 'hands on' assignments designed to reinforce the key concepts from each session.

Enrollment

This course is limited to 20 participants

Session dates & times

Session One – Wednesday January 12, 9-11am
Session Two – Wednesday January 19, 9-11am
Session One – Wednesday January 26, 9-11am

Location

TMEC 306 (all three sessions), the course will take place in person*

Detailed information about sessions can be found below.

*Physical Distancing

The HMS policy for in-person courses is that vaccinated individuals need not maintain any physical distancing, but that masks are required for indoor activities. Students who are not comfortable with this arrangement are asked to approach the course director or a member of the instructional staff before the first class meeting to discuss alternate arrangements. Reasons not to be comfortable may include not being vaccinated, having a medical issue that makes one more vulnerable, or being in close contact with an immunocompromised individual.

Session 1 | Biology and genomics of childhood cancers

Objectives

- Compare the incidence of childhood cancers and inherited risk factors to adult cancers
- Understand the differences in the genomic landscape of childhood cancers compared to adult cancers
- Recognize the interplay between tumor growth and normal development

Session 1 will begin with a discussion on the incidence of childhood cancers and familial risk factors (30 min), followed by a small group work on how the rarity of childhood cancers may affect basic, translational, and clinical research (30 min). We will then have a hands-on session to explore the genomic landscape of childhood cancers compared to adult cancers (30 min). Lastly, we will have a discussion on the possible interplays between tumor growth and childhood development (30 min).

Pre-Session 2 Assignment

- Write the considerations required for clinical sequencing assays for childhood cancers (1 page max)
- What are the principles in determining which methods are the best to detect relevant alterations?
- How can one differentiate between driver and passenger events?

Session 2 | Precision medicine approaches and clinical trial design

Objectives

- Review clinical classification methods for pediatric tumors
- Critically evaluate in vitro and in vivo preclinical data testing targeted therapies
- Understand current clinical trial design strategies involving targeted therapies

Session 2 will begin with a review of the pre-session 2 assignment followed by a review of clinical and diagnostic classification methods (20 min). We will then have a brainstorming session regarding the factors to consider when designing in vitro and in vivo studies for use of targeted therapies against pediatric tumors (40 min). Lastly, we'll give an interactive discussion on current targeted therapy clinical trials for pediatric cancers (60 min).

Pre-Session 3 Assignment

Write the considerations required for a pediatric clinical trial.
You've received an excited call by your former classmate who now works at a pharma start up. They believe their drug X inhibits HDAC, and they know you are trying to cure pediatric diffuse midline glioma. Their drug has previously been tested in adult lymphoma patients.

- What preclinical data would get you interested in this drug?
- What clinical data would get you interested in this drug?
- What kind of trial would you want to design?

Session 3 | Late effects and patient/family perspectives

Objectives

- Understand the challenges childhood survivors face using a holistic perspective
- Discuss implications of targeted inhibitors in the context of development
- Hear from the patient and family perspective and participate in discussion with them regarding their experiences

Session 3 will start with a review of the pre-session 3 assignment (20 min). We'll then have an overview of conventional chemotherapy and radiation late effects, leading to a discussion of the necessity of evaluating targeted therapies to improve survival and quality of life (20 min). We will then brainstorm the unknown late effects of targeted therapies (20min). Students will hear directly from the family of a child who has experienced the diagnosis and treatment of a brain tumor and have the opportunity to ask questions (45min). Lastly, we will provide a wrap up debrief session (20min).