



# Precision Medicine

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In this issue of *Pediatric Annals*, we endeavored to provide a series of reviews to provide the general practitioner with a broad overview of the concepts behind precision medicine as it has been applied to pediatric hematology/oncology. Significant advances in sequencing technology over the past few decades and the ever-increasing access of practitioners, as well as patients and their families, to a growing number of sequencing platforms, it will become more important for the general practitioner to develop an understanding of the principles behind genomic sequencing and how this information could be applied to guide diagnostics and therapy planning. In the first article, “Role of Precision Medicine in Pediatric Oncology,” Drs. Christine Cahaney, Aditi Dhir, and Taumoha Ghosh provide a review of

the key concepts of precision medicine and describe the evolution of sequencing technologies and its applications in pediatric oncology. They highlight how our enriched understanding of various molecular alterations across the spectrum of pediatric cancer has led to the revision of diagnostic classifications and the development of molecularly informed risk stratifications. Although the potential of precision medicine to increase our understanding of pediatric tumor biology and inform the treatment of rare, high-risk cancers like high-grade glioma or metastatic/recurrent sarcoma, Cahaney and colleagues describe the challenges of full implementation of precision medicine in pediatric oncology, which is echoed in other pediatric subspecialties. Although interpretation of sequencing or complementary molecular assays are done in close collaboration with the pediatric hematologist/oncologist or similarly trained subspecialist, a general knowledge of the concepts and principles behind an ever-increasing number of molecular profiling assays and indications for their applications in clinical care will become important as patients and their families come into increasing contact with these technologies as a result of increased commercialization of molecular assays. In partnership with subspecialty teams with advanced knowledge of precision medicine technologies, the general pediatrician can help to provide guidance

to patients and families who may be motivated to explore and pay for costly testing that may be inappropriate or provide little (or misleading) information about a given diagnosis.

In addition to providing insight into the biology of pediatric cancers and therapy guidance, genomic testing is also fundamental in proper screening for cancer predisposition syndromes (CPS). In the second article, “Childhood Cancer Predisposition: An Overview for the General Pediatrician,” Dr. Laura Kagami, Sarah Baldino, and Dr. Suzanne P. MacFarland provide an updated review of the more common CPS and detail current recommendations for surveillance in patients diagnosed with a CPS. It has become increasingly evident that CPS are more prevalent than previously perceived and can occur in the absence of a family history of cancer. Hence, the pediatrician plays a key role in identifying patients and families who are predisposed for a CPS so that timely referrals to a genetic counselor or oncologist are made and potential morbidity associated with a CPS diagnosis mitigated.

Although increased awareness and surveillance for CPS are important in anticipating the development of cancer, it is equally important to improve our awareness of the unique biologic and nonbiologic challenges faced by children, adolescents, and young adults (AYA) who are faced with a cancer diagnosis. As described by Drs. Alexandra

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Disclosure: The authors have no relevant financial relationships to disclose.

doi:10.3928/19382359-20211207-04

Rodriguez-Hernandez and Justine M. Kahn, in the third article, “Improving Health Equity and Reducing Pediatric Cancer Disparities: The Role of the Medical Home,” more than 80% of pediatric cancer patients will go on to become long-term survivors but will require life-long monitoring for late effects. In a review of health disparities in pediatric oncology, Rodriguez-Hernandez and Kahn highlight the importance and role of the medical home for cancer survivors and how the pediatrician can play a key role in helping patients navigate the numerous services that are often required to manage the physical and psychosocial sequelae of cancer treatment. Similarly, in the fourth article, “Adolescents and Young Adults with Cancer: Survivorship and Special Considerations,” Drs. Lenat Joffe and Dara M. Steinberg, Tiffany Strohli, and Dr. Melissa Beauchemin describe the unique challenges of the AYA patient and the specialized care that this population of patients require, considering the biologic and psychological transitions an AYA patient may be experiencing. Although pediatricians often “hand off” their patients to

the oncology team immediately after a cancer diagnosis, they reassume the role as primary care provider when patients emerge from their treatment as a cancer survivor, carrying with them a distinct and unique set of physical and psychological conditions. Therefore, it becomes increasingly important for the pediatrician to be aware of the issues and obstacles faced by AYA and survivors of cancer to facilitate and advocate for needed support services.

The pediatrician’s role in helping cancer survivors continues to grow with improved survival due to advances in technology, such as the use of precision medicine like cellular medicine—a therapy in which viable cells are infused into a patient to induce an immune-mediated response toward a specific target. Examples of these are transplanting modified T cells to fight against leukemia or transplanting hematopoietic stem cells. Hematopoietic stem cell transplantation (HSCT) can also be used to cure nonmalignant diseases such as sickle cell disease (SCD). In the final article, “Evolving Strategies in the Management of Sickle Cell Disease in

the 21st Century and the Role of the Pediatrician,” Drs. Viney Hardit, Ofelia Alvarez, Edward Ziga, and Warren Alperstein review SCD and advances in therapies, specifically with the role of HSCT. With increasing numbers of patients going to HSCT, those with malignant and nonmalignant diseases, it is important for pediatricians to understand the specifics of follow-up care that they will need to provide.

With ongoing improvements in sequencing technologies, which can now generate whole-genome sequencing results in less than 2 weeks, compared to 13 years for the first human genome, we eagerly anticipate improvements in our understanding of pediatric cancer and even nonmalignant hematological diseases, which we hope to translate into improved survival and healthier outcomes for children and AYA patients diagnosed. With a growing population of cancer survivors, the role of the pediatrician becomes equally important in ensuring proper access to supportive care services and facilitating their transition to a healthy and productive life as a cancer or HSCT survivor.