Childhood cancer: unique opportunities and inherent challenges

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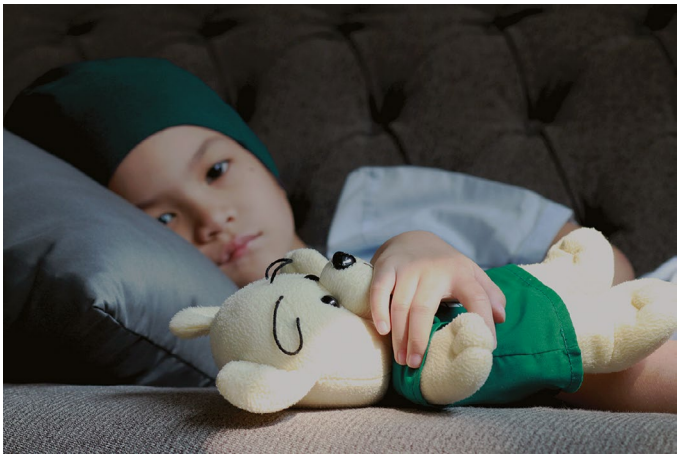
As the incidence of childhood cancer rises, challenges include delivering personalised precision medicine and minimising the late effects of disease and treatment

Cancer is the leading cause of disease-related death during childhood.[1] Cancer in children and adolescents has profound impacts at the individual, family, community, and population levels that are comparable with the burdens of cancer in adults. Moreover, cancer in children is associated with unique opportunities and challenges. They include a lack of knowledge about causative and preventive factors for most childhood cancers, the loss of a lifetime of potential when a child succumbs to their disease, and, for survivors, the lifelong sequelae of cancer diagnosis and treatment.[1,2]

The dramatic improvement in survival for children with cancer is a major success story of modern medicine. Over the past 50 years, major improvements in survival have been recorded, primarily because of advances in multimodality treatment approaches, risk stratification, chemotherapy intensification, and supportive care.[3] Nevertheless, some forms of paediatric cancer still have dismal prognoses.[1–3] Diffuse intrinsic pontine glioma (DIPG), for example, is a highly aggressive brain tumour for which there is no curative treatment, and the median overall survival from diagnosis is less than one year.[4] One challenge when treating childhood cancers such as DIPG is the inter- and intratumoral heterogeneity that may explain the failure of one-size-fits-all treatment approaches.[2,5] Next generation sequencing techniques are increasingly used to determine the molecular drivers of tumorigenesis, with the goal of more effectively matching drugs to targets.[2,5] Implementing this precision medicine is challenging because of regulatory, economic and commercial barriers to drug access in an era in which there have been almost no industry-driven therapeutic developments for children with cancer.[5]

A key contributor to improving survival rates for children with cancer has been the emphasis on enrolling patients in clinical trials, motivated by the rarity of childhood cancers and the need to establish consensus about best practice for the benefit of children with these diseases.[6] National and international collaboration between paediatric oncology centres has underpinned the success of many of these clinical trials and continues to be a major focus for the paediatric oncology community.[6] Despite these successes, survival rates are still relatively poor for many children with cancer because of limitations in supportive care, drug accessibility, and infrastructure in countries that are less well resourced. The problems that dominate childhood cancer in low and middle income countries differ substantially from those in high income nations.



According to the analysis of Australian Childhood Cancer Registry data reported in this issue of the *MJA*, the incidence rate of childhood cancer in Australia increased by 1.2% per annum between 2005 and 2015.[7] The authors of the study also report the concerning projection of a further 7% rise over the next 20 years.[7] More modest annual increases have been reported by population-based studies in the United States (1975–2006: 0.6%)[3] and Canada (1992–2010: 0.4%).[8] The reasons for the increasing incidence of childhood cancer are unclear but may be linked with improved diagnostic techniques and early detection of lesions that are histologically benign but clinically significant. The incidence of central nervous system (CNS) tumours, for example, is reported to have increased in Australia,[7] Canada,[8] and the US,[9] and these rises may be directly attributable to developments in magnetic resonance imaging (MRI) and improved early detection of both benign and malignant tumours of the CNS. The projected increase in childhood cancer incidence will have a significant population impact, including the need for appropriate funding, personnel, and equipment to meet the increasing needs of the patients.[7]

As survival rates improve for children and young adults with cancer, there is emerging awareness of the pervading physical, emotional and psychological tolls on survivors of a childhood cancer diagnosis and treatment. Two-thirds of patients with childhood cancers have significant long term treatment side effects, including organ dysfunction, neurocognitive deficits, impaired fertility, and secondary malignancies.[10,11] The impact of the late sequelae of childhood cancer and treatment is extremely significant and it is imperative that efforts to minimise late effects continue, as well as providing services that meet the physical, emotional and psychological needs of survivors.[11]

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Childhood cancer care in the modern era is a dichotomy of unique opportunities and inherent challenges. Despite dramatic improvement in overall survival, some subtypes of paediatric cancer remain incurable. As the incidence of paediatric cancer rises, challenges for the future include minimising the late effects of disease and its treatment, and further developing personalised approaches to cancer therapy.

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