

# **Parent-Child Electronic Health Intervention to Improve Cognitive and Educational Outcomes in Survivors of Childhood Cancer.**

Sunita Patel, Ph.D<sup>1</sup>; Kathleen Ingman, Ph.D<sup>2</sup>; Paula Aristizabel, MD<sup>3</sup>., Caroline Hastings, MD<sup>4</sup>; Dina Hankin, Ph.D<sup>4</sup>; Lisa Mueller, MD<sup>5</sup>; Lennie Wong, Ph.D<sup>1</sup>; Saro Armenian, DO<sup>1</sup>

<sup>1</sup>City of Hope Cancer Center, Duarte, CA; <sup>2</sup> USC Children's Hospital Los Angeles, LA, CA;

<sup>3</sup>UCSD Rady Children's Hospital, San Diego, CA; <sup>4</sup>UCSF Benioff Childrens Hospital, Oakland, CA; <sup>5</sup> Kaiser Permanente Los Angeles Medical Center, LA, CA.

As the population of childhood cancer survivors grows, so does the impact of long-term treatment-related side effects. Children treated for leukemia and lymphoblastic lymphoma (LL) may experience long-lasting “neurocognitive late effects” caused by the toxicity of their treatments on the developing brain. These effects can impact their learning, function, and ability to achieve independence as adults. However, there is a dearth of empirically evaluated interventions to address these effects.

Recognizing the impact of familial factors on survivors' outcomes, we designed a parent-directed training intervention (the High-intensity Intervention Program, HIP), which teaches parents about brain development and growth mindset; trains them to use strategies to improve their children's behavior and cognitive functioning; offers tips for effective study habits and an environment conducive to learning; and fosters parent-child relationships to enhance resilience.

In our first pilot trial of HIP, with a cohort of English-speaking childhood cancer survivors (CCSs) and their parents, we observed improved academic functioning in the children and improved parenting efficacy. Subsequent pilot trials of HIP involving English- and Spanish-speaking families provided evidence supporting the impact of the program but also revealed critical barriers to success, such as travel time and scheduling constraints. In our most recently completed trial of HIP, we enrolled 106 Latino CCSs and their parents, randomly assigned them to HIP (n=54) or a Lower Intensity Program (LIP; n=52), which consisted of a single feedback session modeled after treatment-as-usual neuropsychological services. The trial demonstrated that HIP enhanced parenting efficacy across the 12-month intervention period. The children's academic/school and psychosocial outcomes improved from baseline to 6 months but were not sustained at 12 months.

We are currently conducting a randomized clinical trial of 166 English- and Spanish-speaking parent/child dyads from 4 pediatric cancer centers in California to investigate the impact of a new eHealth version of HIP that incorporates improvements recommended by parents from earlier trials. HIP-eHealth features a study website with multimedia content, remote delivery of streamlined HIP sessions, increased child involvement through an online learning program targeting their academic weaknesses, and an enhanced booster phase.

Our study compares HIP-eHealth to LIP to: (1) Evaluate the effectiveness of HIP-eHealth on the learning and school performance of pediatric cancer survivors; (2) Evaluate the effectiveness of HIP-eHealth on the “pro-learning” efficacy of their parents; (3) Investigate the extent to which parenting efficacy and/or the children's use of online learning activities is associated with changes in their school performance; and (4) Assess factors that impact the parents' ability to complete the intervention.