

## Early rehabilitation to improve functional outcomes in childhood cancer in Singapore

### Dear Editor,

We conducted a prospective, single-centre cohort study to review the impact of a multidisciplinary rehabilitation programme in children with cancer in Singapore. The Template for Intervention Description and Replication (TIDieR) checklist was used to allow sufficient details for replication of the study (see Appendix in online Supplementary Material).<sup>1</sup> The study was funded by Children's Cancer Foundation, a Singapore charity.

In Singapore, there were 720 cases of childhood cancer (below 19 years) between 2013 and 2017, with an incidence rate of 17 per 100,000 population.<sup>2</sup> With the advent of targeted medical therapy, childhood cancer survivorship has been reported at 80% in Singapore.<sup>3</sup> Along with the improved survival rate, the long-term side effects of cancer treatment—for instance, reduced physical functioning, self-esteem and quality of life<sup>4-6</sup>—are becoming all the more pertinent to understanding the true burden of the disease.<sup>4</sup>

There are limited studies exploring the impact of a multidisciplinary approach on functional outcomes in children with cancer in the acute setting. A 2-week intensive multidisciplinary programme in the acute setting found significant gains in function with no adverse effects.<sup>7</sup> A scoping review of 12 studies supports the feasibility of physiotherapy intervention for childhood cancer; however, the current evidence is not yet at a level to inform clinical practice.<sup>8</sup>

We recruited Singapore citizens and permanent residents, aged 2 to 17 years, who were newly diagnosed with cancer from March 2017 through November 2020. Children with relapsed cancer were excluded. As part of this new programme, baseline functional status was assessed one working day after their confirmed diagnosis. This contrasted with the usual practice of a physician-directed referral for rehabilitation only when a deficit was noticed. The assessments were conducted by registered allied health professionals (for example, physiotherapists) accredited to administer the Functional Independence Measure for Children (WeeFIM), and the Goal Attainment Scale (GAS). The WeeFIM and GAS were subsequently repeated at 3, 6, 9 and 12 months. Following the baseline assessment, children participated in an individualised programme based on their needs. This included one or more of the following: music, occupational, physio-

and speech therapy. The aim of therapy was to return children to their premorbid status and address any developmental delay or impairment. The interventions were conducted in person by the respective disciplines either in the inpatient or outpatient setting, with each session lasting about 45 minutes. The frequency of interventions ranged from daily to weekly. Functional impairments were identified at the baseline assessment and reviewed at the follow-up time points; therapy was adjusted as required. In children assessed to have no deficits, and rehabilitation deemed unnecessary, caregivers were advised to monitor their functional ability and self-refer for rehabilitation if required later.

Patient safety was a priority, especially during the acute phase of cancer treatment. The patient's clinical status was evaluated prior to each session, and parameters such as haemoglobin and platelet level were taken into consideration. Interventions were thus adjusted to account for the side effects of cancer treatment.

Statistical analysis was conducted on the 4 domains of WeeFIM—self-care, mobility, cognition and overall function. Three-way mixed analysis of variance (2 x 3 x 5 mixed analysis of variance) was used to analyse the data. The independent variables included sex, diagnosis (blood cancer, solid tumour or brain tumour), and time (0, 3, 6, 9 and 12 months). A frequency analysis was done to observe common types of GAS for this population and the rate of achievement of these goals.

There were 91 children recruited into the study who were assessed at baseline for functional impairment. Of this number, only 34 children consisting of 21 boys and 13 girls required intervention. The mean age was 9.13 years (standard deviation = 4.73). The distribution of cancer diagnoses was 14 solid tumour cases, 11 blood cancer cases and 9 brain tumour cases.

There was a significant main effect of time (from baseline) on domains of self-care ( $F(2.03, 56.36) = 14.70, P < 0.01$ ), mobility ( $F(2.51, 70.15) = 12.97, P < 0.01$ ), and total functioning score ( $F(2.03, 56.94) = 11.12, P < 0.01$ ). There was, however, no significant main effect of time on cognition ( $F(1.05, 29.40) = 1.93, P = 0.18$ ). The mean values showed progressive linear improvement, except for cognition. This non-effect on cognition is not surprising as the majority were not brain tumours.

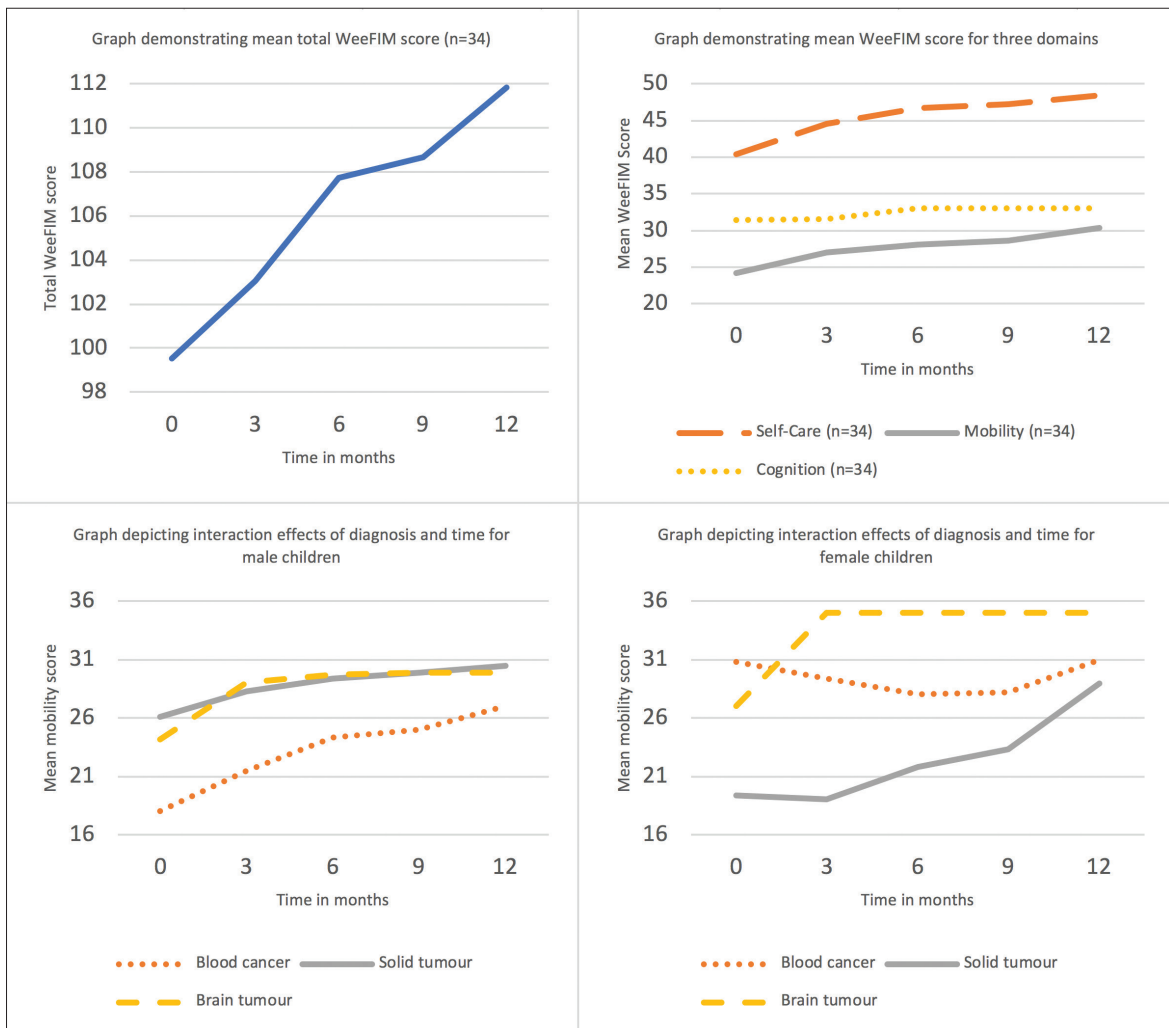


Fig. 1. Graph depicting the Functional Independence Measure for Children (WeeFIM) results.

Lastly, sex differences on mobility scores were noted when the interaction between time and type of diagnosis were considered ( $F(5.01, 70.15) = 2.76, P=0.03$ ). The trends can be seen in Fig. 1.

WeeFIM was primarily developed as a measure of disability rather than function. Despite its original intent, we were able to demonstrate a change in total score after the programme. The significant sex effect on mobility scores might be explained by sex differences: a systematic review found that males were more successful in their gross motor skills.<sup>9</sup>

A total of 155 GAS were formulated and mapped to domains of the World Health Organization International Classification Framework to classify the types of goals that were set. A total of 56 goals (36.1%) were under the domain of Body Functions and Impairments, 98 goals (63.2%) under the domain of Activity and Participation and 1 goal (0.6%) under the Environmental domain.

A high number of 142 (91.6%) goals were met or exceeded. Only 13 (8.4%) goals were not met and 11 of these were from the Activity and Participation domain. Upon analysis, one of the main reasons they were not achieved was due to complications during cancer treatment, such as stroke.

Improving functional ability in children translates to an increase in physical activity, participation and quality of life.<sup>10</sup> Our study did not uncover any adverse events and supports the safety and efficacy of rehabilitation in the acute phase of cancer. Although improvements in functional ability were found, interpretation of results should be taken with caution as there was no control group. Despite a long recruitment period, the rare nature of childhood cancer limits the sample size. Future multicentre studies will hopefully strengthen the evidence base and expand the body of literature regarding paediatric oncologic rehabilitation.

### Acknowledgements

The authors would like to acknowledge Julia Xue and Amanda Siew for their contribution towards the research and Singapore Children's Cancer Foundation for their funding support.

### REFERENCES

- Hoffmann T, Glasziou P, Boutron I, et al. Better reporting of interventions: template for intervention description and replication (TIDieR) checklist and guide. *BMJ* 2014;348:g1687.
- Health Promotion Board. Singapore Cancer Registry Anniversary Monograph 1968 -2017. [https://www.nrdo.gov.sg/docs/librariesprovider3/default-document-library/thespore-cancerregistry\\_commerativebook\\_-1.pdf?sfvrsn=231fce6e\\_0](https://www.nrdo.gov.sg/docs/librariesprovider3/default-document-library/thespore-cancerregistry_commerativebook_-1.pdf?sfvrsn=231fce6e_0). Accessed 11 July 2020.
- Allemani C, Matsuda T, Di Carlo V, et al. Global surveillance of trends in cancer survival 2000–14 (CONCORD-3): analysis of individual records for 37 513 025 patients diagnosed with one of 18 cancers from 322 population-based registries in 71 countries. *Lancet* 2018;391:1023-75.
- Kruijssen-Jaarsma M, Révész D, Bierings MB, et al. Effects of exercise on immune function in patients with cancer: A systematic review. *Exerc Immunol Rev* 2013;19:120-43.
- Wacker K, Tanner L, Ovans J, et al. Improving Functional Mobility in Children and Adolescents Undergoing Treatment for Non-Central Nervous System Cancers: A Systematic Review. *PM R* 2017;9:S385-97.
- Pek JH, Chan YH, Yeoh AEJ, et al. Health-related Quality of Life in Children with Cancer Undergoing Treatment: A First Look at the Singapore Experience. *Ann Acad Med Singap* 2010;39:43-8.
- Tsao E, Flanigan M, Johnson L, et al. Functional outcomes of pediatric patients in Short-term Pediatric Rehabilitation Intensive Therapy (SPRINT) while receiving acute oncologic and hematologic care. *PM R* 2022;14:357-65.
- Ospina PA, McNeely ML. A Scoping Review of Physical Therapy Interventions for Childhood Cancers. *Physiother Can* 2019 Summer;71:287-96.
- Rodrigues P, Ribeiro M, Barros R, et al. Performance on the movement assessment battery for children: A systematic review about gender differences. *Rev Int de Cienc Deporte* 2019;15:72-87.
- Grilli L, Feldman DE, Majnemer A, et al. Associations between a Functional Independence Measure (WeeFIM) and the Pediatric Quality of Life Inventory (PedsQL4.0) in Young Children with Physical Disabilities. *Qual Life Res* 2006;15:1023-31.

Lindsey Weller<sup>1</sup>*MPH*, Kayla Wong<sup>2</sup>*MMusTherpy*,  
Ce Yu Foo<sup>3</sup>*MSc*, Wei Zhi Leo<sup>4</sup>*BSc*, Beron Tan<sup>5</sup>*PhD*,  
Satyaki Sengupta<sup>6</sup>*DPT*, Jasper Tong<sup>6</sup>*PhD*,  
Mei Yoke Chan<sup>7</sup>*MMed*

<sup>1</sup>Physiotherapy Department, KK Women's and Children's Hospital, Singapore

<sup>2</sup>Child Life, Art and Music Therapy Programme, Rehabilitation Centre KK Women's and Children's Hospital, Singapore

<sup>3</sup>Occupational Therapy Services, Rehabilitation Centre, KK Women's and Children's Hospital, Singapore

<sup>4</sup>Speech Therapy Services, Rehabilitation Centre, KK Women's and Children's Hospital, Singapore

<sup>5</sup>Psychology Service, KK Women's and Children's Hospital, Singapore

<sup>6</sup>Allied Health Specialities, KK Women's and Children's Hospital, Singapore

<sup>7</sup>Paediatric Haematology/Oncology Services, KK Women's and Children's Hospital, Singapore

Correspondence: Ms Lindsey Weller, Physiotherapy Department, KK Women's and Children's Hospital, 100 Bukit Timah Road, Singapore 229899.

Email: lindsey.jean.rw@kkh.com.sg