



# Healthcare providers' promotion of physical activity among child and adolescent cancer survivors: strategies and challenges

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## Abstract

**Purpose** This study aims to investigate how healthcare providers (HCPs) promote physical activity (PA) to child and adolescent cancer survivors.

**Methods** Semi-structured interviews were conducted with HCPs ( $n = 16$ ; women  $n = 12$ ; men  $n = 4$ ) who provide care for cancer survivor youth (age 3 to 18). Participants represented 7 professions, including child life specialists, oncologists, nurse practitioners, physical therapists, and social workers. A reflexive thematic analysis was conducted to explore the techniques that HCPs use to promote PA for this patient population and ways PA promotion can improve.

**Results** HCPs use five strategies to promote PA to cancer survivor youth: (1) broadening the definition of PA, (2) tailoring PA recommendations, (3) including families, (4) connecting patients to programming, and (5) promoting patient motivation.

**Conclusions** This research highlights techniques that HCPs use to promote PA to young cancer survivors and reveals the need for additional ways to support HCPs to improve PA promotion for child and adolescent cancer survivors. While HCPs emphasized the importance of PA for this patient population, they navigate barriers that limit the quality of PA discussions.

**Implications for cancer survivors** Further research should explore interventions to improve PA promotion and PA participation among child and adolescent cancer survivors. By understanding the perspectives of HCPs, patients, and their families, PA promotion strategies can be improved, and more programs that support both patients and practitioners may be developed.

**Keywords** Cancer · Physical activity · Health promotion · Pediatric

Cancer is the leading disease-related cause of death for children ages 0 to 14 and adolescents ages 15–19 in the USA [1]. Over the past several decades, significant improvements in child and adolescent cancer treatments have increased the likelihood of long-term survival. Current 5-year survival rates are 84% for childhood cancers and 83 to 86% for

adolescent cancers in the USA [2, 3]. As survival rates for both child and adolescent cancers improve, it is important to consider the immediate and long-term late effects of cancer treatment in survivorship care.

Childhood and adolescent cancer survivors are at risk for developing a wide range of life-long adverse health outcomes. Detrimental physiological conditions resulting from cancer treatment include immune system impairment [4, 5], cognitive dysfunction [6], diabetes [7], cardiovascular disease [8, 9], cancer recurrence [10], pain [11, 12], fatigue [13], and obesity [14] among others. In addition, the psychosocial well-being of childhood and adolescent cancer survivors may be negatively impacted by symptoms of depression [15, 16], anxiety [16, 17], and post-traumatic stress disorder [18]. This population can also experience social isolation and loneliness. For example, child cancer survivors may have challenges returning to school and forming healthy peer relationships [19, 20]. Adolescent cancer survivors grapple with feelings of isolation, loneliness, and

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lack of self-confidence in the short term, and continue to face ongoing concerns with fertility, romantic relationships, education, and careers that impact their long-term quality of life and well-being [21, 22]. Additionally, child and adolescent cancer survivors can experience a loss of independence, including their ability to complete daily routines and pursue their interests [23].

Another critical concern for child and adolescent cancer survivors is lower levels of physical activity (PA) compared to their peers without a history of cancer [24–26]. For example, unstructured active play is a common way children participate in PA [27, 28]. However, children diagnosed with leukemia have fewer unstructured play behaviors than children without a cancer diagnosis [29]. One of the most frequently mentioned reasons for reduced quality of life in adolescents with cancer is the inability to participate in sports while undergoing cancer treatment [30]. Cancer type and treatment may impact PA participation in the short term for both child and adolescent cancer survivors due to their high risk of infection, nausea, pain, and potential physical impairments [31–34]. Low levels of PA, in combination with late effects of cancer treatment, may result in poorer physical, physiological, and psychosocial health outcomes [24]. For example, childhood survivors of acute lymphoblastic leukemia were reported to be more sedentary and at risk for reduced cardiorespiratory fitness [35].

A growing body of research suggests that PA can directly mitigate some of these physical and psychosocial health complications [36, 37]. Child and adolescent cancer survivors who are physically active are more likely to report improved health-related quality of life and reduced fear of cancer recurrence [38]. Moreover, adult survivors of childhood cancer who engage in vigorous exercise reduce their risk of cardiovascular complications, regardless of treatment variables such as type and duration [39]. Many national oncological organizations and physicians acknowledge the benefits of PA for child and adolescent cancer survivors and recommend PA to patients [40, 41]. One set of well-respected PA guidelines was developed by the Children's Oncology Group which recommends survivors partake in regular exercise and that survivors should consult with their physicians to define any potential limits [42]. Another set of general PA guidelines has been released by the American Cancer Society that recommend children and teens engage in 1 h of moderate to vigorous physical activity per day [43]. However, more population-specific evidence is needed for the development of official national guidelines.

Despite the known benefits of PA for child and adolescent cancer survivors and the steps taken to develop PA guidelines by reputable organizations, the low levels of PA engagement within this population begs the question of how to effectively promote PA. One potential avenue is via health care providers (HCPs) (e.g., physicians, nurses, child life

specialists). PA counseling by HCPs has been a successful and cost-effective method for PA promotion among diverse patient populations [44–48]. The US Department of Health and Human Services' Healthy People 2020 and 2030 prioritizes private conversations between HCPs and patients to promote positive health behaviors such as PA [49]. Furthermore, physician counseling has been shown to increase PA levels among children without cancer [50]. However, literature on HCPs' promotion of PA is lacking within the child and adolescent oncology population. Despite childhood and adolescent cancer survivors and their families' appreciation for their physicians' advice [50, 51], many young survivors do not receive guidance from their HCPs regarding PA [30]. This study aimed to investigate the strategies used by HCPs in response to challenges experienced when promoting PA participation among child and adolescent cancer survivors. A better understanding of HCPs' PA promotion strategies and the challenges associated with PA promotion can inform future interventions and potentially influence the training of HCPs in pediatric and adolescent oncology.

## Methods

### Philosophical Assumptions

This research was guided by ontological relativism and epistemological constructionism. Relativist ontology is grounded in the belief that the human experience defines our reality [52] and epistemological construction is the philosophical perspective that guides our research in discerning new meaning and knowledge based on participants' experiences [53]. This study acknowledges that different realities exist based on the unique lived experiences of diverse individuals. Each HCPs will have different perspectives based on their practice, education, and previous experiences. This study purposively sampled healthcare professionals that reflect this diversity within child and adolescent cancer care.

### Participants

Participants were required to be English-speaking HCPs who deliver direct care to the child and/or adolescent cancer survivors between the ages of 3 and 18. Maximum variation sampling was used with the goal of gaining perspectives from HCPs across cancer care teams (oncologists, hematologists, hematology-oncology residents, nurses, child life specialists, physical therapists, social workers, and psychologists). Participants were recruited from across the USA through direct emails and social media. The research team also reached out to relevant cancer survivorship groups asking them to distribute study information via their listservs. Study participants who had engaged in interviews were also

asked to share study information with their interested colleagues. Due to this widespread recruitment approach, data on the number of HCPs who saw the study recruitment information and refused to participate is not available.

Sixteen HCPs (12 women, four men) participated in interviews representing the western, southern, midwestern, and northeastern USA. Participants included oncologists, physical therapists, child life specialists, nurse practitioners, nurse coordinators, clinical social workers, and dieticians who work in child and adolescent oncology and survivorship. Some participants also had previous clinical roles outside cancer care. Participants not currently employed in one of the aforementioned positions could still be interviewed if they held one of these roles within the last 3 years. See Table 1 for full demographic information.

## Procedure

The interviews were conducted by the Principal Investigator (PI), an Assistant Professor of Medicine who holds a Ph.D., and the lead author, a Clinical Research Associate. The PI is an expert in health promotion and behavior change, with a focus on physical activity for populations with illnesses. She is also an expert in qualitative research, teaching Master's courses on this method. The lead author was trained in conducting qualitative interviews and analyzing qualitative data by the PI. The interviewers were interested in exploring HCP's perspective of PA among child and adolescent cancer survivors. Interest in youth with illness or impairments and promoting PA among this population drove the interviewers' research goals. Interviewers' perspective of PA and youth with illness or impairment also serves as a potential bias during the interviews. Participants took part in one semi-structured interview via Zoom or phone call. The interviewers did not know the respondents prior to the interviews. The respondents were aware of the goals of the research, the purpose of this specific study, and its long-term vision. Video was only recorded if participants chose to leave their cameras on. However, only the audio files were saved. Field notes were taken during and after each interview, including notation of respondents' nonverbal cues. Interviews were conducted between May and October of 2020 and spanned an average of 45 min each, ranging from 30 to 60 min. There were no repeat interviews. The geographic distribution of the participants and hospital visitor restrictions due to COVID-19 limited the ability to conduct in-person data collection. Fortunately, research has demonstrated that conducting virtual interviews does not impact data quality [54]. The number of participants recruited was guided by information power, with a specific focus on the strength and quality of the information provided in interviews, as well as variability in participant responses [55].

## Interview Guide

The semi-structured interview guide was divided into four sections: (1) opening questions focused on understanding the participant's experiences in cancer survivorship (e.g., can you tell me about your role in working with child and adolescent cancer survivors?); (2) perspectives of physical activity for this population (e.g., what are your thoughts in child and adolescent cancer survivors participating in physical activity?); (3) how physical activity is approached with patients (e.g., what does promoting physical activity to your patients look like?); and (4) closing questions focused on participant perspectives of ideal physical activity programming for child and adolescent cancer survivors, as well as any aspects of participant experience with PA promotion that had not yet been discussed. At the beginning of the interview, the interviewer defined cancer survivorship as any point after an initial cancer diagnosis. The interviewer's definition is consistent with the National Cancer Institute's definition of a cancer survivor [56]. The interview guide was pilot tested with an expert in AYA cancer care and also reviewed by experts in PA and AYA care. This pilot testing resulted in small edits to question order. Further minor edits to question wording were made after the first two interviews (see Supplemental Files for a copy of the final interview guide).

## Analysis

The researchers conducted a reflexive thematic analysis to identify themes that illustrate the strategies HCPs use to promote PA and explore HCPs' experiences and challenges with and perceptions of PA promotion [57]. The interviews were transcribed verbatim using Rev, an online transcription service. The transcripts were then reviewed by the first author alongside the recordings for accuracy. During this review, the first author also added their interview notes and non-verbal cues to the transcripts. First, the lead author, who also conducted the interviews, immersed herself in the data through several re-readings of the interview transcripts and handwritten notes taken during the interviews. The lead author took notes on initial concepts, questions, and thoughts related to the data set as the readings proceeded. The transcripts were then imported to NVivo qualitative data software for analysis. Using NVivo, codes, reflective of meaningful units in the data, were generated. These codes were then grouped into themes representing different techniques that HCPs use to promote PA to young cancer survivors. Reflection and further interpretation among study staff resulted in the themes being refined, renamed, and regrouped. The co-authors acted as critical friends to encourage the coder to consider alternate interpretations of the data based on their own experiences in physical activity

**Table 1** Sociodemographic characteristics of participants and patient population

Pseudonym	Patient demographics									
	Participant demographics	Age (years)	Gender	Race/ethnicity	Role	Years in role	Physical activity participation	Age range (years)	Race/ethnicity	Insurance coverage
Ana	40	Female	White/Caucasian	Child life specialist	18		Yes: hiking, running in workplace	0–25	White, African American, Arab	N/A
Kerri	N/A	Female	White/Caucasian	Clinical social worker	20		Yes: walking	0–26	Hispanic, Caucasian, Asian, Black, mixed race	Medi-Cal, Other
Mallory	31	Female	White/Caucasian	Physical therapist	5 in oncology (6.5 total)		Yes: marathon training, peloton biking, swimming	0–45	Hispanic, White, Arab	Other
Derek	45	Male	White/Caucasian	Pediatric oncologist/survivorship clinic	12		No	8–65	Hispanic, White, Black, Asian	Medi-Cal, Other
Natasha	53	Female	Black	Nurse practitioner	17		No	2–48	Multiple	Private, Medi-Cal
Maryanne	50	Female	White/Caucasian	Nurse practitioner	23		Yes: biking, walking	0–26	Caucasian, African American, Hispanic, Asia	Other
Dhruv	49	Male	Southeast Asian	Pediatric oncologist/survivorship clinic	20		Yes: work around the house, yard work, mowing lawn	6–39	White/Caucasian, African American	N/A
Camila	39	Female	White/Caucasian	Clinical social worker	6 in oncology (12 total)		Yes: walking, yoga	2–60	White/Caucasian, Hispanic	Medicaid, other
Ester	30 s	Female	White/Caucasian	Nurse practitioner in survivorship	3		Yes	3–62	Multiple	Private, Medicaid
Amal	53	Female	Asian	Pediatric hematology/oncology, medical director of survivorship clinic	17		Yes: walking, strength training, dance classes	0–60	Hispanic, Caucasian, African American	Medicare/Medicaid, other
Caroline	53	Female	White/Caucasian	Clinical social worker	12 in oncology		Yes: hiking, yoga, walking	4–21	Hispanic, Asian, African American	Medi-Cal, Medicaid
Kimberly	29	Female	White/Caucasian	Dietician	3		Yes: yoga, swimming	0–22	Hispanic, White/Caucasian, African American	Medi-Cal, other
Burt	53	Male	White/Caucasian	Nurse practitioner	11		Yes: running, yoga	1–25	Hispanic, White, African American, Asian, Middle Eastern	Other

**Table 1** (continued)

Pseudonym	Patient demographics								
	Participant demographics	Age (years)	Gender	Race/ethnicity	Role	Years in role	Physical activity participation	Age range (years)	Race/ethnicity
Talia	46	Female	White/Caucasian	Nurse practitioner	15	Yes: swimming, elliptical, walking	2–27	Hispanic	Medi-Cal, private, other
Rose	41	Female	White/Caucasian	Survivorship nurse coordinator	5	Yes: fitness classes	2–56	White/Caucasian, Hispanic, Asian American, Black, other	Medicaid, private
Marcus	37	Male	White/Caucasian	Pediatric cancer rehab specialist/senior physical therapist	6.5	Yes: on the job, running, weight training	0–25	White, Hispanic, Alaska Native/American Indian	Private, Medicaid

promotion and/or AYA cancer survivorship. Moreover, different literature was presented to help contextualize the findings. Participants were not asked to provide feedback on these findings. The quality of the research was guided by the twenty critical questions identified by Braun and Clarke as reflective of quality practice in reflexive thematic analysis [58].

## Results and discussion

The researchers identified five strategies that HCPs use to promote PA to child and adolescent cancer survivors: (1) broadening patient understanding of the definition of PA, (2) tailoring PA recommendations, (3) including families, (4) connecting patients to programming, and (5) promoting patient motivation.

### Broadening patient understanding of the definition of PA

Cancer and cancer treatment cause late effects that can make the most basic physical movements challenging for patients [59]. According to the HCPs in our study, many patients and HCPs view PA as a rigorous exercise regimen that is carried out in a gym or other specialized facility. Much of the literature on PA interventions is consistent with this perspective, focusing on implementing moderate to vigorous exercise-based interventions [60, 61]. This narrowed understanding of PA and the physical limitations experienced by many cancer patients makes initiating a PA program seem inaccessible. As such, our participants discussed broadening this limited definition of PA to encourage movement for their young patients by simplifying the definition of PA to its original form: any bodily movement that expends energy [62].

...It's never like, here are the things you should do. It's just, I just talk to them about their life and then figure out what parts of their life they can get their heart rate up. And, uh, and then we go from there. So, and I like to encourage them that, hey, anything you do can be some good physical activity. There are, there are certain things about life where if you just take the long way...well there's stairs there, right?...Every chance you get, stop taking the elevator and just, and do the stairs. And if you get fatigue, give yourself an elevator ride, that's fine. But you know, you start to, uh, you start that, that process of them looking at their world and saying, where can I be active...There's always... physical activity is built into life and you just have to

look for it and figure out where it works for the patient. (Marcus, pediatric cancer rehabilitation specialist)

HCPs explained that low-intensity PA, such as stretching and walking, is valuable and that the PA their patients engage in does not need to be complex. The HCPs frequently brought up low-effort ways to incorporate movement into patients' lives, such as doing PA from home, using household items as equipment alternatives, or following online dance tutorials. HCPs also discussed indirect ways of promoting movement. For example, one HCP explained below how she uses her hospital's dog therapy program to encourage her child and adolescent cancer patients to incorporate movement into their day:

For example, somebody really likes dogs, then I will use that in my back pocket when we're trying to get them moving so to somebody that doesn't realize it, oh, Ana's trying to get them a dog visit to have something fun to do. Well, sure, yes I am, but also I'm getting them to walk down the hallway, I'm getting them out of their room, I'm getting them to sit up in a chair. I'm getting them to lean over and pet the dog. I'm getting them to walk the dog down the hallway, when the visit's over. So it has different levels. It's not just about petting a cute dog, which is great. But, it has other things so, we kind of do things indirectly. (Ana, child life specialist)

By spending time with a dog, this patient participates in a type of PA that is situated outside the traditional definition of exercise or sport. As Ana noted, the patient likely does not even realize that they are doing PA, but they are active and enjoying it. Many of our participants emphasized the significance of small activities that simply get their patients out of bed and moving. By expanding patients' understanding of the definition of PA and encouraging patients to engage in low-intensity PA, HCPs hope to build their patients' strength and endurance, allowing them to ease into more vigorous, long-term PA and eventual lifelong activity.

Ana's example also relates to active play, another concept used by our participants to circumvent typical PA frameworks and simplify PA. Active play is defined as a freely chosen, unstructured activity [63]. HCPs focused on promoting active play behaviors as an excellent way for their pediatric patients to be physically active. Rose, a nurse coordinator, provided an example of how she promotes active play to her patients:

With kids I think I talk a lot about play. And how the things that they do already are exercise. How riding your bike and playing soccer with your friends on the playground, things like that are exercise. That it doesn't need to be maybe the things they see their parents doing for exercise.

Structured forms of PA are often the focus of adult oncology physical activity programming [64], which may not translate well to pediatric programming. Presenting unstructured PA, such as active play, instead of structured exercise to pediatric oncology populations allows HCPs to discuss PA as approachable, fun, and developmentally appropriate for the younger age group. Active play offers physical, social, and psychological health benefits for children and young adolescents. Youth who engage in active play learn conflict resolution skills, social skills, self-confidence, and self-efficacy [65] while also obtaining physical health and physical literacy benefits, which may be lower among survivors of childhood cancer [65–69].

### Tailoring PA recommendations

Participants noted that youth cancer survivors often feel like they lose bodily autonomy upon admission to the hospital. Surgeries, injections, and medications are decisions regularly made by HCPs without the patient's input. These experiences may hinder a patient's sense of freedom with their body. PA presented an opportunity to tailor the conversation to the patients' interests and allow them to make their own choices about the activities they pursue as a way to return a sense of control to the patient. This approach is evidence-based, with research demonstrating that providing options to children increases their sense of self-determination and level of PA [70]. However, several HCPs expressed frustration with the challenging nature of tailoring conversations and guidelines. The majority of participants reported never having received training in PA promotion. Some provide only generic PA recommendations to their patients and do not feel qualified to offer more tailored PA advice. For example, they have often provided their patients with resources from the Children's Oncology Group, which gives recommendations for PA intensity and duration throughout cancer survivorship [71]. Dr. Dhruv, an oncologist, spoke about the complex nature of tailoring interventions and the multiple considerations involved:

What's the right thing for a nine-year-old to do, versus what's the right thing for a 16-year-old to do? Is it the Fitbit ten thousand steps? You hear all kinds of mixed things about that. Or is it that they have to play a team sport? Do they have to do something competitive? Or how do you judge that?

I think that's a little bit hard in terms of what actual recommendations... I tend to give more generic or generalized recommendations, but certainly knowing what is age appropriate for them. Also it's also hard to figure out what can the family do or afford, right? I don't know all their financial issues. I don't know where they live.

This lack of training presents an opportunity to create programs for practitioners to improve the quality of PA-related conversations with patients. Despite the lack of formal training, several HCPs described using their own experiences with PA. Previous research has shown that physicians that exercise regularly are more likely to counsel their patients to exercise [72, 73]. Physicians may recommend activities that they enjoy, share advice on how they stay motivated, or recommend PA mobile applications that they use [73].

Some HCPs personalized their PA recommendations based on their patients' specific interests. This approach, referred to in the literature as "tailoring" physical activity and health messaging, is well-supported in health behavior research as an effective approach for improving engagement in a behavior [74–77]. The first step to tailoring is information seeking and, in particular, gaining an understanding of the individual's interest in and perceptions of the behavior [78, 79]. While HCPs noted that they had no formal training in behavioral science, this step came naturally with participants seeking to learn about their patients' hobbies and then suggesting activities their patients would enjoy and have high motivation to engage in. Examples provided included activities like ballet or skateboarding. They stressed the importance of respectful discourse with child and adolescent patients to establish a strong rapport. Talia, a nurse practitioner, provided an example of the kinds of questions she asks to explore her patients' interests:

We talk about, "there's so many different sports out there, what are you interested in? It's summer now, what about swimming? Do you know how to swim? Is there a pool in your area?" When we get to the fall and start talking about high school sports, "are you interested in playing for any high school teams? 'Cause that's a really good way to meet people and be involved in many ways in high school, and it also looks good on college applications that you're involved in extra curricular activities." So, I try and promote it in different ways. And I ask them, "What sports do you like? What are you interested in?" It's hard, 'cause everyone's so different.

HCPs emphasized that they did not want PA to be a dreaded task for their patients. Instead, they intend to help them discover ways to be active while also having fun. Furthermore, the variety of approaches taken by this participant to initiate conversations around PA with patients highlighted the heterogeneity of pediatric cancer survivors. Such tailoring also conveyed the importance of HCPs' careful consideration of the nuances experienced by each developmental group within this population. For teen patients who prioritized their social relationships, HCPs recommended that they get involved in social forms of PA, such as going on walks with friends or joining a sports team. Kimberly, a

dietician, highlighted how she tries to identify fun ways for her teen patients to do PA based on their individual interests:

Whereas teenagers [are] more like trying to help them find something that they enjoy doing, otherwise they're going to get bored and stop. "If you don't like running, don't feel like have to go for a run, like join yoga, do Pilates, do Zumba, play basketball with your friends or soccer, like get a, like a rec league together, join a softball team, you know?" 'Cause teenagers are very into their friends and doing things with their peers. (...) "Why don't we try to join a team or make a team or play with our friends playing in the park or do this, you know?" It's more like doing things with peers or doing things that they enjoy that don't feel like an arduous task, like homework, because they already have enough of that in their life. So you want it to be like something that they enjoy that can help relieve stress. That's not just like another tick check box that they have to do.

By allowing patients to steer the conversation surrounding PA based on their interests, patients develop a sense of control over their bodies [80]. This approach may be particularly effective for teenagers, who have unique social and developmental needs, for teenagers are highly motivated by their peers and are also striving to become more independent. Beyond being a successful method for promoting PA [81–84], utilizing this autonomy-supportive approach to care is positively correlated with cancer patients' perceptions of control and involvement during visits and their satisfaction with HCPs' levels of collaboration.

### Including families

Another strategy implemented by participants was the inclusion of patients' families when discussing PA interventions. Participants discussed two challenges to promoting PA that they encounter with families: (1) families who do not prioritize PA and (2) families who are fearful of their child taking part in PA. According to the participants, family members, especially parents, influence child and adolescent cancer survivors' PA levels and overall lifestyle. This perspective is reinforced in existing literature [85, 86]. For example, when parents engage in PA themselves, their children are more likely to be active [50, 87–89].

Participants explained that some families might prioritize PA while other families do not, which is consistent with previous research [90]. As such, children may be raised with different values surrounding PA that influence their PA behaviors [90]. When treating younger children, our HCPs rely on patients' parents to promote and encourage PA once they are discharged from the hospital. While discussing the importance of PA with families with a strong culture of

activity is straightforward, having those conversations with more sedentary families is more challenging. The HCPs we interviewed report focusing on PA interventions that include the entire family to overcome this barrier. However, motivating families that previously have low levels of PA or may not value PA continues to be a challenge. Kerri, a clinical social worker, expressed how having conversations about PA with inactive families is difficult:

(...) may be multiple conversations. It may be rationalization with some families. I think it is hard if it's not something that they value then you're going to have to build in a new value for them and that can be difficult. (...) It's often difficult when we have a family who is... you look around the room and everyone in there should be doing more exercise and activity and then you tell them that their child needs it. It's a hard message sometimes if it's not the kind of culture of the family.

Support from family members is critical for adopting and maintaining lifestyle changes [91–93]. This is especially true for younger children and adolescents whose parents are the important decision-makers in a child's PA participation. Though it can be challenging to introduce an unfamiliar lifestyle change, involving families in the discussion can improve follow-through and allow HCPs to gather more information about the patient [94]. Engaging the whole family in PA interventions has been demonstrated to be a successful approach for behavior change among children and families without illnesses [95–99]. Furthermore, PA research suggests that involving families may be essential for long-term behavior change [100–102].

Including patients' families in the conversation about PA with HCPs was also essential to dispel myths or quell concerns that parents may have regarding their child being involved in PA. Our participants described how parents might limit their child's PA levels due to the perception of extreme severity and susceptibility to injury or infection. Talia, a nurse practitioner, provided an example of a patient whose parents "wouldn't even let him bring groceries into the house because they were afraid that was too much exercise to stress his body after his cancer treatment. So, he wanted to do it, but the parents didn't."

Parents of children with cancer may often become overly cautious in safeguarding their child's well-being [31, 103]. Heightened parental perceptions of risk are a well-documented barrier to PA among parents of children with diverse physical illnesses and impairments [104, 105]. For example, research on parents of children with mobility impairments noted increased perception of susceptibility to injury among parents [106]. This increased perception of risk was a deterrent to supporting their children's participation in sport [106]. This study found that parents of children with mobility impairments identified support from their medical

team as a facilitator for improving their perceptions of PA and ability to encourage their children's sport participation [106]. Therefore, many of our participants highlighted parents' concerns regarding PA and providing them with information about safety and risks as a key aspect of PA promotion and alleviating a "sick child mindset."

### Connecting patients to programming

Participants described a lack of PA programming available for youth cancer survivors in hospital, outpatient, and community settings. Kimberly, a dietician, revealed that while a few PA programs are available to children at her hospital, long waitlists make it difficult for patients to access. Burt, a nurse practitioner expressed his frustration with the lifestyle programming available to young cancer survivors at his hospital:

For those patients say that have some kind of physical deformity because of chemo or radiation surgery, I don't think we have a great streamlined program to help teach them what they're able to do during their life. The documentation I've seen, for example, from ortho surgery is more about what you're not allowed to do with as opposed to what [you can].

He explained that, in his opinion, the limited PA programming does not meet this patient population's unique needs that would accommodate any acquired physical disability. Other participants echoed this sentiment, explaining that a one-size-fits-all approach taken by some cancer-focused PA programs is not adequate for a population with diverse physical needs and interests. However, a recent individualized community-based exercise program for children with cancer and their siblings was found to be safe, feasible, and sustainable [107]. Nevertheless, access to such programs is limited, and HCPs and the programs available may not be of interest to patients. For example, Kerri, a clinical social worker, explained that some children are unwilling to participate in group activities.

Patient navigation is an approach that has been demonstrated to be effective in existing research on adults with physical illnesses and injuries resulting in impairment [108]. Many participants focused on navigating their patients towards appropriate programming. While a few participants refer their patients to PA programming within their hospitals or health centers, many recommend programs outside of the hospital. Most commonly, they refer patients to local YMCAs. The clinical social workers, in particular, connect their patients to external organizations that provide PA opportunities to young cancer survivors. These organizations may offer athletic lessons to pediatric cancer patients, work to combat social isolation through organized group activities, or provide adaptive activity opportunities.



Some HCPs described promising partnerships their hospital may have had with local organizations that support chronically ill youth but that these partnerships fall short due to lapses in funding. Several spoke about a desire for more formal PA opportunities affiliated with their hospitals, such as group activities, exercise classes, individual coaching, and readily available PA equipment. Other participants emphasized that these PA opportunities should be held outside of the hospital setting to alleviate potential patient distress and transportation barriers. However, HCPs acknowledged that opportunities to participate in community-based activities are also limited. Camila, a clinical social worker, believes that establishing more PA programs within her patients' communities is an effective way to engage child and adolescent cancer survivors in PA who may have difficulty accessing hospital-based programming:

For kids, we're one of only two survivorship programs in the state. A lot of our kids are coming from rural areas. Even if we had some sort of physical activity program at our institution for kids under 18, there was just wouldn't be good enough access for kids. The majority of our patients who don't live in the Metro area. So I think it really has to be kind of dispersed or with a fit for them in their communities and something that they can, if it's something we want them to do ongoing.

These practitioners express a desire for more inclusive PA programs within their patients' respective communities. Such PA programming can be incorporated into school-based physical education and after-school programs.

### Promoting patient motivation

Lack of motivation was the most frequently discussed barrier to PA promotion. Social, psychological, and physical factors contributed to a lack of motivation among patients. For many participants' patients, especially adolescent patients, PA was not a priority. Instead, they preferred to participate in sedentary activities, like watching television or playing video games.

...It seems like the older kids get into teenage years and young adulthood they, um, even without a cancer diagnoses, end up spending more time in front of a screen and less time outside or being physically active and I think being sick and/or hospitalized just amplifies that. (Rose, nurse coordinator)

Rose's observation is consistent with existing literature. In 2009, Singer and colleagues concluded that children spend most of their free time watching television [109]. Additionally, as noted in the "Families" theme, participants explained that sometimes these young patients, their

families, and their HCPs could develop a "sick child mindset," where they view the child as fragile and limit their activity to focus on their cancer illness.

Participants linked these preferences to the concept of motivation. Specifically, patients may feel unmotivated to engage in PA due to physical health restrictions associated with cancer and cancer treatment, such as nausea or shortness of breath, or the paraphernalia associated with hospitals and treatments, including masks and IV lines. Cancer patients may be feeling unwell for a significant amount of time and may experience permanent bodily changes. Thus, their relationship with PA may also change and their transition into activities as cancer survivors can be a big adjustment. Kerri, a clinical social worker, explained that her patients might need to re-learn how their bodies perform, making PA more difficult:

[For] our patients that have amputations, physical activity becomes different to them than (...) before. They have to rethink and reshape what they might have been involved with prior and what they feel that they are capable of doing now. And similarly, with the brain tumor patients, I have a lot of brain tumor patients who balance is an issue or lymphatic weakness or other deficits like that. And so for them, exercise means something totally different. I think some of the kids get a lot of benefit out of physical therapy in those cases. (...) Under that kind of guidance, they see that they can do something and then it can take off from there. But, clearly, that adds an extra hurdle for those patients.

To address these physical hurdles and improve motivation, participants employ a range of strategies. Some HCPs celebrate small milestones in their patients' PA success and try to provide them with encouragement and support to build up to more PA. Mallory, a physical therapist, sometimes negotiates compromises with her young patients. She may make an agreement to allow a child to use the department's cooking space if the child partakes in their exercises. Gain-framed approaches to PA promotion is another strategy utilized by HCPs [110, 111]. For example, a provider may use repetition to build positive perceptions of PA by stressing the importance of PA and the resulting health benefits multiple times throughout patients' treatments. However, other HCPs may take loss-framed approaches, which emphasize the potential health consequences of inactivity to encourage their patients to become physically active in order to prevent health complications associated with a sedentary lifestyle. Natasha, a nurse practitioner, employs the loss-framing technique to motivate her young patients to engage in PA:

And sometimes I show them pictures of diabetics, as you can go online and you can find anything... "This is a diabetic and these are the things that diabetes can do

to you, or this is a hypertensive, these are things. And look, look, look, they had to get their fingers amputated. They had to cut them off. They had to do this. They oh, and then they have to go to this place called dialysis where you're not urinating and you can't pee anymore." You know, you just tell them. "These are the things that you need to do to prevent these things. Oh, when they went blind, they can't see anymore." And it helps that we have a pediatric diabetic clinic right in the same area that we work in. So they can actually see some of those patients.

These loss-framed health promotion messages were mentioned a number of times by participants who wanted to let their patients know the risks of being inactive. Unfortunately, message framing research has demonstrated that loss-framed messages does not promote PA participation effectively [110, 112]. HCPs were aware that general encouragement in addition to gain and loss-framed approaches were rarely effective. Providers expressed a desire for behavioral training (e.g., motivational interviewing) and evidence-based interventions to learn more effective ways to help their patients be more physically active. Developing educational opportunities for HCPs that target patients' motivation and PA promotion may improve patients' willingness to engage in PA [113].

## Conclusion

The aim of this study was to investigate the strategies used by HCPs to promote PA among child and adolescent cancer survivors in response to challenges experienced in PA promotion. Five themes were ultimately identified representative of five strategies: broadening the definition of PA, tailoring PA recommendations, including families, connecting patients to programming, and promoting patient motivation. These findings bolster the limited literature regarding PA promotion for child and adolescent cancer survivors and provide directions for future research.

Of note, participants detailed that optimizing the implementation of these strategies required teamwork. There was a strong desire to improve multidisciplinary HCP teamwork and collaboration to promote PA among the child and adolescent oncological population. However, as has been noted in other populations with illnesses and injuries that influence PA [114, 115], achieving this goal requires dedicated health promotion training for HCPs [116–118]. If provided with specific evidence-based training on PA promotion and behavior change, HCPs may address topics relating to PA engagement more effectively throughout the continuum of cancer care. Previous research demonstrated that first-year medical students' awareness of PA guidelines improved following an

intervention focusing on PA education [73]. Additionally, second-year medical students report improved attitudes towards PA and intentions to discuss PA after completing an exercise counseling workshop [119]. Such training can also help HCPs address any familial concerns, given that parental perceptions of PA are very influential on children's overall PA participation [120, 121]. We recommend HCPs to receive evidence-based training on PA promotion beginning in medical, graduate, or nursing school and as part of their continued medical education in clinical and hospital settings to help improve child and adolescent cancer survivors PA engagement.

There are limitations in the current paper that should be considered. First, the study could have benefitted from greater representation of diverse HCP roles such as inclusion of more child life specialists who are heavily involved in care. Second, this study was conducted in the context of the COVID-19 pandemic. Thus, it had been a number of months since HCPs had "normal" visits with their patients. The recent conversations HCPs were having with their patients may have prioritized health and safety concerns other than PA given the acute pandemic challenges to cancer care. Suggestions for PA participation may have also been modified due to the high risk status of their patients. As such, much of the discussion was based on recall of pre-pandemic patient suggestions and interactions. Additionally, patient visits were adapted to a virtual format which may result in differing topics or shortened visit duration.

Future studies should continue examining HCP's strategies for promoting PA to better understand which are most effective in promoting long-term PA participation among child and adolescent cancer survivors. As this current research examined HCP perspectives exclusively, we suggest that future research include interviews with patients and their families to provide more context to the realities of PA promotion and its implementation. Ideally, strategies promoting PA among child and adolescent cancer survivors can be refined and programs that effectively support patients and providers can be developed by gaining a thorough understanding of HCPs, their patients, and their families' perspectives.

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## Declarations

**Conflict of interest** The authors declare no competing interests.

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