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A Cross-Sectional Examination of Caregiver Mental Health and Childhood Cancer Survivors' Tobacco, Alcohol and Marijuana Use

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Abstract

Purpose—As childhood cancer survivors (CCS) age, they face numerous long-term consequences, or late effects, from their cancer treatments. Late effects may be mitigated by health promoting behaviors, including the avoidance of substance use. CCS with greater depression symptomology have reported greater substance use, but whether their habits are associated with the mental health of their caregivers is unknown. The aim of this study was to examine caregiver psychosocial correlates of CCS substance use.

Methods—This study utilizes data from the Project Forward pilot study, which collected data from 129 CCS-caregiver dyads (CCS mean age =19.43, SD= 2.78; years since diagnosis = 7.62, SD= 2.06) from two large hospitals in Los Angeles County. CCS provided self-reported information on substance use, while caregivers self-reported on posttraumatic stress symptomatology (PTSS) associated with their child's cancer and current depressive symptoms.

Results—Among CCS, prior 30-day tobacco, marijuana, binge drinking and polysubstance use were 12.50%, 14.17%, 13.18% and 12.40%. In multivariable logistic regression models, caregiver PTSS was independently positively associated with CCS tobacco use. No other significant relationships between caregiver mental health (PTSS or depressive symptoms) and CCS substance use were observed.

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Conflict of Interest The authors declare that they have no conflict of interest.

Ethics Approval This study was approved by the California Committee for the Protection of Human Subjects, the California Cancer Registry, and the Institutional Review Boards at the University of Southern California, Children's Hospital Los Angeles, and Miller Children's Hospital in Long Beach. This study certifies that it was conducted in accordance with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Consent to Participate Informed consent was obtained from all individual participants over the age of 18 years old included in the study. Informed consent for participants under 18 years old was obtained by their parents.

Conclusion—These findings suggest that caregiver PTSS is partially associated with CCS behavioral health. Survivorship care may improve tobacco use prevention efforts by incorporating family or caregiver mental health needs. Future research should examine the potential mediating effect of CCS mental health, including depressive symptoms, on this relationship.

Keywords

Childhood cancer survivors; caregiver and CCS mental health; substance use; CCS follow-up care; childhood cancer survivorship

Childhood cancer is the second leading cause of death in the US among individuals under 14 years old [1]. In recent decades, targeted treatments have increased survival rates from 58% to over 80% [1]. However, these treatments are also associated with long-term health consequences including cardiovascular disease, neurocognitive deficits, second cancer diagnoses and infertility [2–5]. Prospective studies following childhood cancer survivors (CCS) suggest that over 70% will develop at least one late effect from treatment [6]. Use of substances such as marijuana, tobacco and alcohol throughout adolescence has been implicated as a risk factor for poor liver, pulmonary and cardiac outcomes in the general population [7–8]. These consequences are particularly worrisome for CCS as their cancer history already places them at a greater risk of health problems [9–10]. Nevertheless, research has found that as many as 50% of adolescent and young adult survivors of childhood cancer engage in substance use, though findings are mixed as to whether they engage at rates comparable to their peers [11–14].

When asked about their reasons for substance use engagement, some CCS have cited using substances as a coping mechanism [12, 15]. This may be explained by the presence of depressive symptoms among CCS. Depressive symptoms have been found to be significantly associated with substance use among this vulnerable population (OR_{adj} = 1.7, 95% CI = 1.4 to 2.2) [15–16]. Based on previous research using the database for the current study, Milam et al. [17] found depressive symptoms to be positively associated with binge drinking (OR = 1.03, 95% CI 1.00 to 1.07) and marijuana use (OR = 1.04, 95% CI 1.01 to 1.09). CCS depressive symptoms have also been found to be at least partially influenced by caregiver mental health [18].

CCS caregivers are at increased risk for exhibiting depressive or posttraumatic stress symptoms [19–22]. For example, Norberg & Boman [20] found that CCS mothers and fathers were both significantly more likely to exhibit PTSS and depressive symptoms compared to matched controls. Meta-analyses have suggested that caregiver posttraumatic stress symptoms are positively associated with CCS posttraumatic stress symptoms [23]. Further, Slaughter et al. [18] found among the present study's sample of 129 caregiver-CCS dyads that caregiver depressive and posttraumatic stress symptoms were significantly positively associated with CCS depressive symptoms.

Although previous studies have investigated the relationships between caregiver and CCS mental health, as well as between CCS depressive symptoms and substance use, little research has looked at the relationship between caregiver mental health and CCS substance use. This study investigated whether caregiver mental health is mental health is

independently associated with CCS substance use to better understand unique social factors that may influence CCS' likelihood to engage in unhealthy behaviors. Understanding factors that contribute to substance use can provide information to help health promotion efforts among at-risk CCS populations [7–8]. It was hypothesized after controlling for covariates that:

1. Caregiver depressive and posttraumatic stress symptoms will be significantly and positively correlated with CCS substance use.
2. Caregiver depressive and/or posttraumatic stress symptoms will be positively associated with CCS substance use independent of CCS depressive symptoms.

Method

Overview

This study analyzed a subset of data collected between 2009 and 2010 as part of the Project Forward pilot study, which included CCS who were diagnosed with cancer before the age of 18 at either of two hospitals: Children's Hospital Los Angeles (CHLA) or Miller Children's Hospital in Long Beach (LBMMC). The sample was selected from the Surveillance, Epidemiology, and End Results (SEER) Cancer Registry for Los Angeles. Hodgkin's survivors were excluded as they were included in a different study. CCS who met these criteria and were 14 - 25 years old in 2009 were contacted for study participation. Parents of the CCS were also included.

Surveys (for parents and CCS) were sent to parents of minors under 18 since parental consent was required for minors to participate. CCS over the age of 18 at the time of the study were contacted directly and were asked to provide permission to contact their parents to participate. Surveys were completed via mail (n=199), online link (27), phone call (4) or interview (5).

Extensive telephone follow-up and remailing of materials was used to increase response. Families with Spanish surnames were sent surveys in English and Spanish. Upon completion, participants (both CCS and parents) received a $20 gift card and were entered into a raffle of $300 value. The response rate for CCS was 50% and for caregivers was 36.5% [24]. Non-respondent characteristics were obtained from cancer registry data. We found no significant differences by age, cancer type, or ethnicity. However, response was higher for females, parents of younger survivors, and those from higher socio-economic status areas [24].

Participants

In total, 235 childhood cancer survivors and 173 CCS caregivers participated, including 160 dyads in which both the parent and child completed surveys. For this analysis, only CCS who had been off treatment for two or more years (a criterion for survivorship) were included, resulting in 129 child-caregiver dyads. Among the 129 CCS, age at survey completion ranged from 15 to 25 years old (M = 19.43, SD = 2.86), 52.71% were female, and 55.04% were Latino. The most common non-Latino ethnicity was white (32.6%). Among the 129 caregivers, ages ranged from 34 to 69 years old (M = 48.85, SD = 7.00),

86.8% were female, 57.36% were Latino and 97.7% were biological parents. Two grandmothers and one stepmother were also included in the caregiver sample. A summary of sample demographic characteristics is presented in Table 1.

Ethical Considerations

This study was approved by the California Committee for the Protection of Human Subjects, the California Cancer Registry, and the Institutional Review Boards at the University of Southern California, Children's Hospital Los Angeles, and Miller Children's Hospital in Long Beach.

Measures

Demographics.—Measured demographics for CCS included age at survey completion, gender, ethnicity, socioeconomic status and relationship to the caregiver. Measured demographics for caregivers included age at survey completion, gender and relationship to the CCS.

Clinical Variables.—Measured clinical variables included years since diagnosis, cancer type and treatment intensity. Treatment intensity was calculated using the Intensity of Treatment Rating Scale (2.0) (ITR-2) and categorized on a 4-point scale with 1= least intensive (e.g., surgery only) and 4= most intensive (e.g., relapse protocols) [25].

Depressive Symptoms.—The 20-item Center for Epidemiological Studies Depression Scale (CES-D) was used to assess CCS and caregiver depressive symptoms [26]. Participants indicated how often they experienced symptoms such as depressed mood, feelings of guilt, sleep or energy changes during the previous week on a 4-point Likert scale ranging from "rarely" (1 day or less) to "most or all of the time" (5-7 days). A total score was calculated from 0 to 60 and then dichotomized based on the scale's cutoff scores (e.g., 16 or greater) indicating those at risk for clinical depression [27]. These cutoff scores have demonstrated good sensitivity, specificity and high internal consistency [27–29]. Among this sample, Cronbach's alphas for the 20-item caregiver and CCS CES-D inventories were 0.81 and 0.92, respectively.

Posttraumatic Stress Symptoms (PTSS).—Caregiver PTSS was assessed with the 22-item Impact of Event Scale-Revised (IES-R) [30]. This scale indexed the presence of re-experiencing/intrusion, avoidance and hyperarousal symptoms within the past week as a consequence of their child's cancer. Answers were provided on a five-point scale ranging from "not at all" to "extremely". Item scores were summed to provide a global score between 0 and 88 and then dichotomized based on the IES-R cutoff scores (e.g. 33 or greater) indicating risk for posttraumatic stress disorder [31]. Sample items include: "I stayed away from reminders of [my child's cancer]" and "I had dreams about [my child's cancer]". While the ideal clinical cut-off score has been debated, this clinical cut-off score is the most restrictive and has demonstrated high sensitivity and specificity [31]. The caregiver IES-R inventory was found to be highly reliable among the current sample ($\alpha = 0.97$).

CCS Substance Use.—The present study measured CCS tobacco, marijuana, binge drinking and polysubstance use. CCS were asked to indicate how many days they had used tobacco or marijuana within the past 30 days. Because substance use increases risk for developing liver, pulmonary and cardiac late effects, participants who endorsed any engagement with either tobacco or marijuana over the past 30 days were categorized as "yes" for that substance use category [7–8].Further, CCS were asked to report how many times in the past 30 days they had more than five alcoholic drinks in one occasion. Endorsement of more than five alcoholic drinks in the past 30 days was coded as a "yes" for binge drinking engagement, based on the Center for Disease Control's (CDC) Youth Risk Behavior Survey [32]. This five-drink binge drinking cutoff, rather than any light/moderate drinking, was assessed as excessive alcohol consumption to serve as a meaningful threshold for high risk for negative social and physical consequences [33–34] [35]. Last, a polysubstance use variable was created with participants who endorsed engagement with 2 or more substances (marijuana, tobacco, or binge drinking) being categorized as a "yes" for this substance use category.

Statistical Analysis

Descriptive frequencies and means were gathered to describe sample characteristics and bivariate point biserial correlational analyses were conducted to determine potential significant relationships among variables. Only variables with significant correlations with the outcome variables of interest (tobacco, marijuana, binge drinking and polysubstance use) were further investigated using multivariable logistic regression models (significance threshold was $p < 0.05$). However, all demographic covariates were forced into these models regardless of significance to fully control personal characteristics. These demographic covariates included: Hispanic ethnicity, caregiver age, caregiver gender, CCS gender, socioeconomic status and CCS age. All logistic regression models modeled the probability of each independent outcome occurring [e.g., "yes" (1) vs. "no" (0) for each substance use category], with a significance threshold of $p < 0.05$. All analyses were conducted using SAS University Edition statistical software Version 9.4 (SAS Institute, Cary, NC, USA).

Results

Bivariate analyses revealed that CCS depressive symptoms (CES-D scale dichotomized between high and low) were positively correlated across the following substance types (Table 2): polysubstance use [$r(129) = .27$, $p = 0.0018$]; tobacco use [$r(128) = 0.23$, $p = 0.0096$]; and binge drinking [$r(129) = .25$. $p = 0.0041$]. Dichotomized CCS depressive symptoms were significantly positively correlated with dichotomized caregiver depressive symptoms [$r(129) = .31$, $p < 0.001$] and posttraumatic stress symptoms (IES-R scale dichotomized between high and low) [$r(129) = .28$, $p = 0.0015$]. Dichotomized caregiver posttraumatic stress symptoms were positively correlated with CCS tobacco use only [$r(128) = 0.24$, $p = 0.0055$]. Dichotomized caregiver depressive symptoms were not associated with any of the four dichotomous substance use categories.

Based on the aforementioned correlational relationships, multiple logistic regression analyses were used to further examine the relationship between caregiver posttraumatic

stress symptoms and CCS tobacco use. This model indicated that caregiver PTSS had a significant positive association with CCS tobacco use, independent of CCS depressive symptoms (OR_{adj} = 4.115, 95% CI 1.072 to 15.797).

Discussion

Among this sample of 129 caregiver/CCS dyads, caregiver posttraumatic stress symptoms were significantly positively correlated with CCS tobacco use, and this relationship remained significant in a controlled logistic regression model. A previous study found that parents who exhibit posttraumatic stress symptoms are more likely themselves to use avoidant coping strategies such as substance use [36]. These avoidant coping strategies have been associated with increased levels of distress among this population [37]. Similarly, a study on childhood cancer survivor's substance usage found that higher levels of distress, particularly worries about treatment effects, directly predicted CCS tobacco use [38]. Thus, because caregiver depressive and posttraumatic symptoms are associated with CCS depressive symptoms, our study's findings may be related to the influence of caregiver PTSS on CCS distress and subsequent substance use [18].

No other significant relationships were found between caregiver PTSS and depressive symptoms and use of the other three substance types (marijuana, binge drinking, and polysubstance use) by CCS. This may be due in part to the higher prevalence of use of these substances among the general population of adolescents. The 2017 Monitoring the Future Study, for example, reported 26%, 45%, and 61% of adolescents used tobacco, marijuana, or alcohol respectively [39]. Because marijuana and alcohol use are more common among adolescents, engagement with these substances may have more opportunity to be affected by peer (vs. parental/caregiver) influence. While peer social influence is also risk factor for adolescent tobacco use, it may be less potent due to the relatively smaller percentage of adolescents who currently use this substance during this time period in their life [40]. Nevertheless, our findings suggest that caregiver mental health may be an important consideration in developing survivorship care plans. Specifically, survivorship care tobacco use prevention efforts may benefit from incorporating family or caregiver mental health needs. Future research should examine the potential mediating role of CCS depressive symptoms on this relationship.

Consistent with prior work among CCS, we found that CCS depressive symptoms were significantly correlated with CCS engagement with three of the four substances measured (tobacco use, binge drinking and polysubstance use). [15–17]. However, among our sample, CCS depressive symptoms were not significantly correlated with marijuana use. Previous research has established that some CCS use marijuana to mitigate the chronic pain that may accompany survivorship [41]. It may be that, among some CCS, decreased physical pain alters their perceptions of their illness, resulting in decreased depressive symptomology. These findings may also be influenced by the recently increased legalization of marijuana use for recreational purposes [41]. Future studies may benefit from incorporating CCS' motivation for marijuana use to clarify this discrepancy.

A primary limitation of this study is the lack of substance use assessment among caregivers. Caregivers who present posttraumatic stress symptoms may be more likely to use maladaptive coping strategies that include substance use [36]. Further, adults who exhibit posttraumatic stress symptoms often use cigarettes to reduce their negative affect [42]. Prior research suggests parent and child coping styles may be correlated among this population [37]. Given this information, it may be that CCS use tobacco because they are modeling their caregiver's method of coping with posttraumatic stress rather than because of the caregiver's symptoms themselves. Thus, future research should incorporate data on caregiver coping mechanisms and substance use to better understand this direct relationship.

This study was also limited in its definition of binge drinking, which was operationalized as consuming 5 or more drinks in one setting. This definition did not take into account criterion gender differences, as women need only consume 4 or more drinks to meet criteria for a binge drinking episode [43]. Consequently, rates of female binge drinking in our sample may have been underestimated as our threshold was higher. Third, the cross-sectional nature of this study limits our ability to infer causal relationships. Last, this sample only included CCS from two hospitals in the same geographic area. Despite these limitations, this study utilized a relatively large, socially and ethnically diverse sample of caregiver/CCS dyads.

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Table 1.

Demographic details and descriptive statistics for main variables of interest for CCS and caregiver samples.

Variable	CCS	Caregiver
Age	M = 19.43 (2.78)	M = 48.85 (7.00)
Sex:		
Male	47.29%	
Female	52.71%	86.8%
Ethnicity		
Asian	3.88%	4.65%
Black	6.20%	6.98%
Hispanic	55.04%	57.36%
White	32.56%	31.01%
Other	2.33%	0.00%
Clinical Variables		
Years Since Diagnosis	M = 7.62 (2.06)	--
Treatment Intensity	M = 2.56 (0.78)	--
Cancer Type		
Bone Cancer	6.98%	--
Brain/Central Nervous System Cancer	16.28%	--
Lymphoma	21.71%	--
Leukemia	25.58%	--
Other	29.45%	--
Substance Use (% Yes)		
Tobacco	12.50% (yes)	--
Marijuana	14.17% (yes)	--
Binge Drinking	13.18% (yes)	--
Polysubstance	12.40% (yes)	--
Depressive Symptoms (High)	29.46% (> 16)	37.21% (>16)
PTSS (High)	--	37.21% (>33)

Table 2.

Point biserial correlations among CCS and caregiver demographic variables and outcomes of interest.

	CCS Age	CCS Gender	Hispanic Ethnicity	SES	Caregiver Age	Caregiver Gender	CCS CES-D	Caregiver CES-D	Caregiver PTSS	CCS Marijuana Use	CCS Tobacco Use	CCS Drink
CCS Age	--											
CCS Gender	0.052	--										
Hispanic Ethnicity	−0.054	0.018	--									
SES	0.017	0.059	−0.639***	--								
Caregiver Age	0.400***	0.081	−0.405***	0.272**	--							
Caregiver Gender	0.027	0.044	0.063	−0.086	−0.191*	--						
CCS CES-D	0.075	−0.103	0.105	−0.138	−0.067	0.101	--					
Caregiver CES-D	0.001	0.022	0.244**	−0.260**	−0.199*	0.015	0.312***	--				
Caregiver PTSS	0.035	−0.042	0.341***	−0.304***	−0.166	0.015	0.277**	0.635***	--			
CCS Marijuana Use	0.061	0.016	−0.171	0.240**	0.085	−0.039	0.145	0.156	0.056	--		
CCS Tobacco Use	0.133	0.024	0.059	−0.045	0.078	0.078	0.228**	0.153	0.244**	0.322***	--	
CCS Binge Drinking	0.190*	0.048	0.030	−0.074	0.090	0.084	0.251**	0.032	0.032	0.371***	0.339***	--
CCS Polysubstance Use	0.083	0.074	−0.133	0.102	0.064	0.077	0.273**	0.148	0.148	0.662***	0.643***	0.688

Abbreviations: CCS, childhood cancer survivor; SES, socioeconomic status; CES-D, dichotomized scores from Center for Epidemiological Studies Depression Scale; PTSS, posttraumatic stress symptoms.

Note: All mental health scores are dichotomized (high vs. low CESD: +/− 16, PTSS: +/− 33); CCS polysubstance use variable rated “yes” if endorsed engagement with 2 or more substances.

* $p < 0.05$,

** $p < 0.01$,

*** $p < 0.001$