

Suicidal Ideation and Attempts in Adult Survivors of Childhood Cancer

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ABSTRACT

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Purpose

This study examined the prevalence of suicidal ideation and past suicide attempt in adult survivors of childhood cancer and investigated the relationship of suicidal symptoms to cancer treatment and current health. The hypothesis that poor physical health would be significantly associated with suicidality after adjusting for mental health variables was specifically tested.

Methods

Two hundred twenty-six adult survivors of childhood cancer (mean age, 28 years) seen in a survivor clinic completed the Short Form-36 and the Beck Depression Inventory (BDI), as well as suicide items from the Symptom Checklist-90 Revised, and Beck Scale for Suicide Ideation. Participants reporting current suicide ideation or any past suicide attempt were classified as suicidal.

Results

Twenty-nine participants (12.83%) reported suicidality, although only 11 of these were significantly depressed by BDI criteria. Univariate analyses found suicidality unrelated to age or sex but positively associated with younger age at diagnosis, longer time since diagnosis, cranial radiation treatment, leukemia diagnosis, depression, hopelessness, pain, and physical appearance concern. A hierarchical logistic regression showed that current physical functioning, including pain, was significantly associated with suicidality even after adjusting for treatment and depression variables.

Conclusion

Suicidal symptoms, which are reported by a significant minority of adult survivors of childhood cancer, are related to cancer treatments and post-treatment mental and physical health. Association of suicidal symptoms with physical health problems is important because these represent treatable conditions for which survivors may seek follow-up care. The relationship of physical well-being to suicidality underscores the need for a multidisciplinary approach to survivor care.

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INTRODUCTION

Suicidal thoughts and behaviors are known to be associated with extreme emotional and physical suffering.¹⁻³ Despite significant advances, cancer and cancer treatments can result in significant physical and emotional morbidity, and several epidemiologic studies indicate that the risk of suicide is elevated in cancer patients compared with the general population.⁴⁻⁸ Recent Scandinavian registry studies have reported standardized mortality ratios for suicide deaths in cancer patients from 1.55 to 2.5 for males and from 1.35 to 2.9 for females compared with the general population.⁵⁻⁷ In a US study of deaths in a single county, Llorente et al⁸ recently reported that risk of suicide among prostate cancer patients was 4.24 compared with the nondiseased population.

Literature reviews on suicide in cancer patients^{4,9} have identified a large number of factors

associated with increased risk of suicide. These include older age and male sex, certain sites of disease (eg, esophageal, pancreatic, and head and neck), higher stage disease, poor prognosis, poor physical functioning, depression, alcoholism, other psychiatric disease, hopelessness, fatigue, pain, loss of function, prior history or family history of suicide attempt, and lack of social support.^{4,9} Despite the substantial literature describing suicidality in patients undergoing cancer therapy, few studies have examined suicidal symptoms in the years after treatment. Studies of suicide ideation and attempt in psychiatrically referred samples suggest that risk is highest in the first few months after diagnosis,¹⁰ but these studies may have a strong selection bias because patients needing psychiatric care years after completion of therapy would be less likely to seek treatment at cancer centers where these studies are often conducted. Epidemiologic studies of completed suicides also indicate risk is greatest in the first 3 to 6

months after cancer diagnosis^{5,7} and declines over time, but these studies may also have limited follow-up beyond 1 or 2 years after diagnosis.^{6,8}

Although a detailed understanding of the natural history of suicide risk after cancer requires more extensive studies of long-term survivors, current data indicate that risk persists for many years after diagnosis. For example, even in studies showing decline in risk over time, excess risk of suicide in cancer patients extends to 5 years or more after diagnosis.^{5,7} In a retrospective study of 60 cancer patient suicides identified in a Finnish registry,¹¹ 25 of these suicides (40%) were in patients in remission, indicating they were not associated with recent diagnosis or terminal illness. The study authors concluded that suicide in cancer patients may differ qualitatively depending on phase of treatment, with different risk and protective factors operating in long-term survivors than in patients with incurable disease. Specifically, they suggest that suicide during remission is associated with a history of mental illness, familial suicides, and comorbidity from other diseases.

To better understand the specific factors associated with suicidality in cancer survivors, this study examined suicidal ideation and attempts in a sample of adult survivors of childhood cancer. Childhood cancer survivors are of particular interest for this investigation because they often receive intensive treatments, many of which can interfere with physical,¹²⁻¹⁵ psychosocial,^{16,17} and neurocognitive¹⁸ development. In addition, because the majority of pediatric patients are cured of their initial cancer,¹⁹ they represent a group of patients who may be at risk for a variety of late effects later in life.²⁰ Suicide ideation and past attempts were chosen for study because of the difficulty collecting detailed and unbiased data after a completed suicide. Epidemiologic studies of completed suicide are often limited to demographic and treatment data available from registries, and case

report data generally rely on retrospective data from family and caregiver informants who may not be reliable reporters. In addition, suicide ideation and prior attempt are significant risk factors for later suicide and are themselves indicators of serious emotional suffering, even when they are not associated with suicidal death.²¹⁻²³

Previous studies at our center have suggested that suicidal symptoms may be a significant problem in childhood cancer survivors. A case series of 10 pediatric patients who completed or attempted suicide found that six of these events occurred after therapy completion.²⁴ In a study of routine psychological screening in a childhood cancer survivor clinic,²⁵ we reported the unexpected result that 14 survivors (13.9%) reported at least one suicidal symptom. To follow-up on these previous findings, the present study examined the prevalence of suicidal ideation and attempts in an expanded sample of adult survivors of childhood cancer and attempted to identify risk factors associated with these symptoms. Specifically, the study tested the hypothesis that physical functioning, including general health and pain, are associated with increased risk for suicidal symptoms even after adjusting for demographic variables, treatment-related variables, and depression.

METHODS

Participants

Participants were 226 survivors of childhood cancer (100 men and 126 women) ages 18 to 64 years old (mean age, 28.38 years; standard deviation [SD], 7.91 years) with a mean age at diagnosis of 10.08 years (SD, 5.47 years; Table 1). The mean time since diagnosis was 18.30 years (SD, 7.90 years). Childhood cancer diagnoses included lymphomas (32.7%), leukemias (32.3%), sarcomas (14.2%), Wilms' tumor (7.5%), and other solid tumors

Table 1. Comparison of Suicidal and Nonsuicidal Adults on Disease and Treatment Variables

Variable	Suicidal Adults (n = 29)		Nonsuicidal Adults (n = 197)		Suicidal v Nonsuicidal Adults	
	No.	%	No.	%	t Test	Odds Ratio
Age, years					1.04*	
Mean	27.38		28.53			
Standard deviation	5.10		8.24			
Age at diagnosis, years					5.21*	
Mean	6.08		10.67			
Standard deviation	4.27		5.39			
Time since diagnosis, years					-3.15*†	
Mean	21.29		17.86			
Standard deviation	4.96		8.16			
Sex						0.87
Male	12	41	88	45		
Female	17	59	109	55		
Diagnosis						Reference
Leukemia	17	59	56	28		
Lymphoma	5	17	69	34		0.24†
Sarcoma	1	3	31	16		0.11‡
Wilms' tumor	4	14	13	7		1.01
Other solid tumors	2	7	28	14		0.24§
Cranial radiation	19	66	58	29		4.49*

**P* < .001.
†*P* < .01.
‡*P* < .05.
§*P* < .10.
||N = 224 participants; 29 in suicidal group, 195 in nonsuicidal group.

such as neuroblastoma and germ cell tumors (13.3%). For clinical reasons, brain tumor survivors are observed in a specialized neuro-oncology clinic and were not included in this study. Ethnicity was not collected on these specific participants, but participants were drawn from a cancer survivor clinic that serves a predominantly (93%) white, non-Hispanic population.²⁵

Procedure

Measures were administered during routine psychological screening at scheduled visits to a multidisciplinary cancer survivor clinic. Consenting participants completed measures before their scheduled appointments. Only information from participants' initial visit to this clinic was included. Procedures were approved by the hospital internal review board. During the first 18 months of the study period, 122 consecutive adult patients were seen in the clinic. Of these 122 patients, four refused psychological services, making them ineligible for the study. All 117 eligible survivors agreed to participate, and 101 (86%) completed at least one scorable measure, with the majority of noncompletion being a result of time constraints. For the remaining study period, recruitment methods remained the same, but participation rates were not recorded.

Measures

Demographic data. Participants provided demographic information such as age and sex. Cancer-related variables, such as diagnosis, age at diagnosis, time since diagnosis, and cranial radiation treatment, were accessed through medical records. Cranial radiation, which was defined as any radiation that included any part of the brain in the treatment field, was treated as a binary variable.

Symptom Checklist-90 Revised. One item from the Symptom Checklist-90 Revised (SCL-90-R)²⁶ (question 15) was included as a measure of suicidal ideation. This item asks participants to rate the amount of distress in the last 7 days caused by thoughts of ending their lives. Any response other than "Not at all" was considered to be an indicator of suicidality.

The Short Form-36. The Short Form-36²⁷ is a 36-item measure assessing health-related quality of life. Scores are generated on eight subscales and two summary scales. The Physical Health Summary score was used to measure overall physical health, and the Bodily Pain Scale measured physical pain. Higher scores on the Short Form-36 scales indicate better functioning.

Beck Depression Inventory. The Beck Depression Inventory (BDI)²⁸ is a 21-item self-report of depressive symptoms over a 7-day period, with total scores ranging from 0 to 63. The total BDI score was used as a continuous measure of depressive symptoms, and three individual items were used to assess suicidality, hopelessness, and appearance dissatisfaction. Responses to these three items were recoded to create three binary variables contrasting participants who reported no symptoms in these areas with participants who reported presence of symptoms regardless of intensity. On the basis of previous research, participants with total scores of 16 or greater were considered depressed.^{29,30}

Beck Scale for Suicidal Ideation. One Beck Scale for Suicidal Ideation^{31,32} item asking participants to report on lifetime history of suicide attempts was included. Participants who reported any attempts were considered suicide attempters.

Statistical Analyses

Participants reporting suicidal ideation on the BDI or SCL-90-R or a past suicide attempt on the Beck Scale for Suicidal Ideation item were classified as suicidal participant cases. Participant cases and noncases were compared on potential risk factors using two-tailed, independent sample *t* tests for continuous variables and odds ratios and Fisher's exact test for discrete variables. When the number of participants in an analysis differed from the total sample because of missing data, the number of participants is noted in the tables.

Because the risk factors are not independent, logistic regression was used to examine which factors were independently associated with suicidality. Twenty-six participants were eliminated because of missing data, leaving 200 participants (including 26 suicidal participants) in the regression. Hierarchical regression was selected to assess whether physical functioning and pain would be significantly associated with suicidal symptoms after adjusting for other variables. In this sample, cranial radiation treatment had a strong positive association with leukemia diagnosis; 87.5% of leukemia patients received

cranial radiation treatment, and all 17 leukemia survivors who reported suicidality had been treated with cranial radiation at total doses of 18 Gy ($n = 1$), 24 Gy ($n = 13$), or greater than 24 Gy ($n = 3$). With cranial radiation and diagnosis so highly correlated, they could not both be included in the multivariate analysis, so diagnosis was excluded. Similarly, time since diagnosis was eliminated because it is highly correlated with age and age at diagnosis.

Variables were entered into the regression in conceptually organized blocks. Block 1 included demographic variables previously reported to be suicide correlates (age and sex). Block 2 included cancer-related variables (age at diagnosis and cranial radiation). Block 3 included the mental health variables (depression and hopelessness), and block 4 included the physical variables (bodily pain, Physical Health Summary score, and appearance concern). At each step, $-2 \log$ likelihood ($-2LL$); Nagelkerke R^2 , indicating proportion of explained variance; and the χ^2 value associated with change in $-2LL$ measuring improved model fit were reported. The Hosmer-Lemeshow goodness-of-fit test was calculated for the final model. The fit of the model was further investigated by testing alternative models with two-way interaction terms and different combinations of the independent variables. No interaction terms were statistically significant, and no alternative models had superior fit.

RESULTS

Self-Reported Suicidal Symptoms

Twenty-nine (12.83%; 95% CI, 8.90% to 18.07%) of 226 participants reported suicidality. Nineteen participants (8.41%; 95% CI, 5.27% to 13.02%) reported suicidal ideation alone; one participant (0.44%; 95% CI, 0.02% to 2.82%) reported past attempts without current ideation, and nine participants (3.98%; 95% CI, 1.95% to 7.67%) reported both current ideation and past attempts. Fifteen participants reported suicidal ideation on both the SCL-90-R and the BDI. Nine participants reported suicidality on the BDI only, and five reported suicidality on the SCL-90-R only.

Risk Factors

Independent sample *t* tests comparing participant cases and noncases yielded several significant findings. Of the cancer-related variables, younger age at diagnosis ($P < .001$), longer time since diagnosis ($P = .003$), and cranial radiation treatment ($P < .001$) were significantly associated with suicidality (Table 1). Leukemia survivors were also more likely to report suicidal symptoms than lymphoma or sarcoma survivors. Of the self-reported functioning variables, depression ($P < .001$), hopelessness ($P < .001$), pain ($P = .01$), and appearance concern ($P < .001$) were also associated with suicidality (Table 2). There was a trend toward lower physical functioning scores among suicidal participants, but this did not reach conventional levels of significance ($t = 1.85$, $P = .075$). Of the 29 suicidal participants, only 11 had BDI scores ≥ 16 , signifying clinically significant depression.

To explore which variables were independently associated with suicidality, a hierarchical logistic regression was computed (Table 3). Entry of demographic variables in block 1 did not improve model fit, but entry of each subsequent block did significantly improve the model. Even after accounting for the demographic, treatment-related, and mental health variables, the introduction of the physical health variables in the last step contributed significantly to the fit of the model ($P = .007$). The final model accounted for 66.2% of the total variability in suicidal participant status ($R^2 = .662$), and the Hosmer-Lemeshow test was nonsignificant ($\chi^2 = 1.42$, $P = .99$), indicating good model fit.

Table 2. Comparison of Suicidal and Nonsuicidal Adults on Self-Report of Current Functioning

Variable	Suicidal Adults			Nonsuicidal Adults			Suicidal v Nonsuicidal	
	No.	Mean	SD	No.	Mean	SD	t Test	Odds Ratio
Bodily pain, n = 225	28	59.36	29.43	195	79.42	23.04	3.50*	
PCS, n = 221	28	45.58	13.43	193	50.43	9.42	1.85†	
BDI, n = 220	29	14.69	9.20	191	3.19	4.37	-6.62‡	
Appearance concern, n = 208								5.28‡
Present	13			29				
Absent	13			153				
Hopelessness, n = 210								11.30‡
Present	18			25				
Absent	10			157				

Abbreviations: SD, standard deviation; PCS, Physical Health Summary score; BDI, Beck Depression Inventory.

* $P < .01$.

† $P < .10$.

‡ $P < .001$.

DISCUSSION

A significant proportion of the adult survivors of childhood cancer studied (12.8%) reported suicidal symptoms. Although no national statistics on suicide ideation and attempts are available, epidemiologic studies indicate that rates of suicidal symptoms are considerably lower in the general population.^{21,33,34} Among 6,041 general medical patients interviewed in the National Institute of Mental Health Epidemiological Catchment Area Survey, 2.65% reported suicidal ideation within the prior year.³⁴ A 2005 report from the National Comorbidity Replication Study, which administered psychiatric interviews to 4,320 adults, found that the 12-month prevalence of suicidal symptoms ranged from 3.3% for ideation to 0.6% for attempts.²¹ In the context of these population-based studies, the present findings strongly support the hypothesis that adult survivors of childhood cancer have elevated risk for suicidality even many years after successful completion of therapy.

As expected, physical health variables, including pain, were significant risk factors for suicidal symptoms. A relationship between pain and suicidality has been reported previously in cancer patients,^{35,36} but these results extend those findings by indicating that the relationship persists into the survivorship period. Poor physical functioning was also associated with suicidality in this study, and it is

noteworthy that both physical functioning and pain are significantly associated with suicidality even after adjustment for depression. This has important implications for developing programs to identify those cancer survivors at risk for suicidal symptoms because it implies that screening for depression alone may not be adequate. Clinicians should be aware of the risk of suicidal symptoms in these survivors and assess them accordingly.

Risk factors identified in the study include those consistently reported for cancer patients and the general population, such as feelings of hopelessness and depression.^{34,37,38} In addition, younger age at diagnosis and cranial radiation treatment were associated with greater likelihood of reporting suicidal symptoms. Younger children may be more vulnerable to the toxic effects of treatment and the related long-term effects. Cranial radiation has been associated with neuropsychological problems^{18,39} and physical disfigurement,⁴⁰ which suggests that the effect of cranial radiation on suicidal symptoms may be mediated by these physical sequelae of treatment. It should be noted that both young age at diagnosis and cranial radiation are strongly associated with an acute lymphoblastic leukemia diagnosis, raising the possibility that they may be the markers for diagnosis, rather than having direct associations with suicidal symptoms. At the time participants in this study were treated, cranial radiation was widely used in treating leukemia. More recently, a growing proportion of leukemia

Table 3. Hierarchical Logistic Regression Analysis for Risk Factors Associated With Suicidality (n = 200)

Step	-2LL	Model R ²	χ^2 Step	P
Block 1, demographic				
Age and Sex	146.59	0.002	0.18	.913
Block 2, cancer related				
Age at diagnosis and cranial radiation	117.57	0.261	29.02	< .001
Block 3, depression				
BDI and hopelessness	74.50	0.583	43.07	< .001
Block 4, physical health				
PCS, BPS, and appearance concern	62.46	0.662	12.04	.007

Abbreviations: -2LL, -2 log likelihood; BDI, Beck Depression Inventory; PCS, Physical Health Summary score; BPS, Bodily Pain Scale.

patients are treated without cranial radiation.⁴¹ As these patients mature into adulthood, future studies of survivors will be able to differentiate between the effects of leukemia diagnosis and cranial radiation. Appearance concern and hopelessness were identified as risk factors in the univariate analyses but were not significant in the regression model. To the extent that appearance concern may be a measure of treatment intensity, its relationship with suicidality may be captured by physical functioning and cranial radiation variables. Appearance concern and hopelessness may have been overshadowed by the depression variable because the two constructs are closely tied to depression.

Inconsistencies were found between the two measures of suicidal ideation. Subtle differences in phrasing may account for different reports on the two measures. For example, the BDI gives respondents experiencing suicidal thoughts the option of explicitly stating they would never act on them. This disclaimer may allow participants to feel more comfortable admitting suicidal ideation on the BDI than on the SCL-90-R, where there is no ability to specify lack of intent. Differences in participant responses to these items support the view of clinical experts that adequate assessment of suicidal ideation requires multiple questions reflecting a range of intensity and symptoms.^{42,43}

Several limitations of the study should be considered. Participants were a convenience sample and not representative of all childhood cancer survivors, and generalizability to survivors from other institutions or sociodemographic backgrounds is not certain. Survivor clinic patients may have more physical and emotional problems than survivors in general, although this clinic sample may be representative of survivors seeking follow-up care and, in that way, be informative to clinicians serving these groups. Survivors in the study reported higher rates of suicidal symptoms than expected based on normative popu-

lation reports, but reports of suicidal symptoms can differ with different assessments. For those reasons, future studies should include a control group to which survivors can be directly compared. A study in progress using data from the large cohort Childhood Cancer Survivor Study⁴⁴ should help to address this issue, as well as the limitations caused by the selection bias noted. This study combined suicidal thoughts and past attempts into a single suicidal variable based, in part, on research indicating that ideation is a strong predictor of suicide attempt and completion. Nevertheless, the questions of how suicidal ideation is related to self-destructive behavior in this population and whether it differs from the relationship seen in psychiatric groups warrant further investigation. Future studies will also benefit from including more extensive data on treatments and specific outcomes like pain duration and intensity.

This study demonstrated that suicidal symptoms are meaningfully related to cancer treatments and post-treatment health, even many years after completion of therapy. Although the vast majority of survivors reported no suicidality, the significant minority of survivors with thoughts of ending their lives is a serious concern. The association with physical health and pain is important because these represent potentially treatable conditions for which survivors may seek follow-up care. The relationship of physical well-being to suicidality also underscores the need for a multidisciplinary approach to survivor care. Complex relationships are unlikely to be clarified unless research moves beyond a mind/body dualism and integrates physical and emotional factors into a comprehensive view of survivors' health. Similarly, in clinical care, providers from different disciplines can independently assess different domains of physical and psychological well-being, but only by integrating these perspectives can they develop an accurate understanding of the survivor's health and quality of life.

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Authors' Disclosures of Potential Conflicts of Interest

The authors indicated no potential conflicts of interest.

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