BRIEF COMMUNICATIONS

An Examination of the Dental Utilization Practices of Adult Survivors of Childhood Cancer: a Report from the Childhood Cancer Survivor Study

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Abstract

Objectives: *This study characterized the self-reported dental utilization practice of long-term survivors of childhood cancer, a group at increased risk for treatment-induced dental abnormalities.* ***Methods:*** *9,434 survivors and a comparison group of 3,858 siblings completed a 289-item survey that included a question on when their last dental visit occurred.* ***Results:*** *Within the last year 60.4 percent of survivors reported a dental visit. The groups less likely to report a recent dental visit include minority subjects, subjects with low levels of educational attainment, subjects with annual household incomes <$20,000, and those without health insurance. No significant differences between survivors and siblings were seen. Male survivors exposed to cranial radiation were slightly more likely than other male survivors to report a recent dental visit (OR=1.27, 95% CI=1.12, 1.44).* ***Conclusions:*** *The dental utilization practices among survivors of childhood cancer are below recommended levels, even among those at highest risk for dental abnormalities. [J Public Health Dent 2004;64(1):50-54]*

Key Words: dental care/utilization, neoplasms, survivors, adult, child, questionnaire, insurance, health.

Marked improvement in survival over the last several decades for many types of childhood cancer has intensified the need for research on late effects from cancer therapies. Many long-term survivors of childhood cancer are at increased risk for treatment-induced dental abnormalities including enamel dysplasia, increased risk for dental caries and gingivitis, root hypoplasia, microdontia, and hypodontia (1-10). Studies suggest that at least 30 percent of all cancer survivors demonstrate some form of dental abnormality, with estimates ranging between 60–95 percent for survivors in certain diagnostic or therapeutic groups(4,5,7,10). Evidence further suggests that cranial radiation increases the risk of dental abnormalities above that of chemotherapy alone (4,5,8).

The increased risk for dental abnormalities highlights the need for regular dental care that facilitates early detection and treatment. Childhood cancer survivors have elevated risks for subsequent primary malignancies (11) and dentists play an important role in oral and pharyngeal cancer detection, as well as the prevention and cessation of tobacco use. The American Dental Association recommends that all adults visit a dentist at least yearly (12). Surprisingly, we found no studies examining the dental utilization practices of long-term cancer survivors.

The Childhood Cancer Survivor Study (CCSS) offers a unique opportunity to characterize the dental utilization practices of adult survivors of childhood cancer. As a prelude to further studies examining dental complications in long-term survivors, we sought to evaluate the following preliminary questions: (1) What are the current self-reported dental utilization practices of this large cohort of survivors of childhood cancer? Do these practices differ by social demographic factors or by cancer-related factors such as cancer diagnosis, age at diagnosis, or interval from cancer diagnosis? (2) Do the dental utilization practices differ from a comparison group of siblings without cancer? (3) Are the dental utilization practices of survivors who were exposed to head and neck irradiation, a particularly high-risk group, different from other childhood cancer survivors?

Methods

The CCSS is a 25 multi-institutional study established in 1994 that follows a cohort of individuals diagnosed with cancer during childhood. Eligibility criteria include: (1) diagnosis and initial treatment of leukemia, malignant brain or other central nervous system tumor, Hodgkin's disease, non-Hodgkin's lymphoma, neuroblastoma, soft tissue sarcoma, kidney cancer, or malignant bone tumor; (2) cancer diagnosis between January 1, 1970, and December 31, 1986; (3) age younger than 21 years at diagnosis; (4) survived five or more years following diagnosis; and (5) English speaking.

The study design and cohort characteristics have been explained in detail elsewhere (13) and will be described here briefly. The CCSS protocol was reviewed and approved by the Human Subjects Committees at each participating institution. After initial contact by the treating institution, par-

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TABLE 1
Percentage of Adult Survivors of Childhood Cancer and Comparison Group of Siblings Who Reported Dental Visit Within the Last Year *[cont. p 51]*

	Women					
	Survivors			Siblings		
	Total	% of Total	95% CI	Total	% of Total	95% CI
Overall	4,452	64.6	63.2, 66.0	1,537	66.8	64.5, 69.2
Age at interview (years)						
18–24	1,835	64.4	62.2, 66.6	450	60.9	56.4, 65.4
25–29	1,116	60.9	58.0, 63.7	375	65.6	60.8, 70.4
30–34	891	66.6	63.5, 67.0	316	65.5	60.3, 70.8
35–39	461	69.1	65.0, 73.4	239	74.9	69.4, 80.4
40	149	69.8	62.4, 77.2	157	75.2	68.4, 81.9
Ethnicity						
White, non-Hispanic	3,869	66.3	64.8, 67.8	1,355	67.2	64.7, 69.7
Hispanic, white	214	50.2	43.5, 57.0	44	52.3	37.5, 67.0
Black	249	53.0	46.8, 59.2	52	61.5	48.3, 74.8
Others	109	60.2	51.0, 69.4	37	70.3	55.5, 85.0
Education						
<High school graduate	395	57.0	52.1, 61.9	74	52.7	41.3, 64.1
High school, some college	2,430	61.2	59.3, 63.2	789	62.6	59.2, 66.0
College graduate	1,352	73.2	70.9, 75.6	617	73.6	70.1, 77.1
Household income						
<$20,000	959	52.3	49.1, 55.4	188	48.9	41.8, 56.1
$20,000	2,965	68.7	67.0, 70.4	1,221	69.4	66.8, 72.0
Health insurance						
Yes or Canadian	3,801	68.0	66.5, 69.5	1,385	68.6	66.2, 71.1
No	587	42.6	38.6, 46.7	137	45.3	36.9, 53.6
Perceived health						
Excellent	797	71.1	68.0, 74.3	340	74.1	69.5, 78.8
Very good	1,673	65.6	63.4, 67.9	676	68.8	65.3, 72.3
Good	1,421	62.6	60.1, 65.1	417	59.5	54.8, 64.2
Fair	440	57.9	53.3, 62.5	84	56.0	45.3, 66.6
Poor	77	51.3	40.1, 62.6	4	25.0	0.00, 67.4
Interval from diagnosis						
5–9 years	127	74.0	66.4, 81.6		NA	
10–14 years	1,126	64.5	61.7, 67.3		NA	
15–19 years	1,657	65.9	63.6, 68.2		NA	
20–24 years	1,264	62.3	59.6, 65.0		NA	
25–29 years	278	63.8	58.1, 69.4		NA	
Cancer diagnosis						
Leukemia	1,392	62.9	60.3, 65.4		NA	
CNS	543	67.7	63.7, 71.6		NA	
Hodgkin's disease	783	68.2	64.9, 71.5		NA	
Non-Hodgkin's lymphoma	255	63.6	57.7, 69.6		NA	
Wilms	346	59.7	54.5, 64.9		NA	
Neuroblastoma	210	59.6	53.0, 66.3	NA	NA	
Soft tissue sarcoma	432	64.9	60.4, 69.4	NA	NA	
Bone	491	66.4	62.2, 70.6	NA	NA	

ticipants were contacted, requesting their participation in the study. Beginning August 1, 1994, participants completed a 289-item questionnaire assessing medical late effects, current medical conditions, medication use, health status, health behaviors, pregnancy history, demographic characteristics, socioeconomic indicators, insurance coverage, and other information. Trained data abstractors at the treating institutions reviewed medical

TABLE 1
Percentage of Adult Survivors of Childhood Cancer and Comparison Group of Siblings Who Reported Dental Visit Within the Last Year *[cont. from p 50]*

	Men					
	Survivors			Siblings		
	Total	% of Total	95% CI	Total	% of Total	95% CI
Overall	5,083	56.6	55.3, 58.0	1,379	61.5	58.9, 64.1
Age at interview (years)						
18–24	2,082	60.4	58.3, 62.5	449	65.0	60.6, 69.4
25–29	1,425	50.5	47.9, 53.1	298	55.7	50.1, 61.3
30–34	980	56.5	53.4, 59.6	309	52.8	47.2, 58.3
35–39	431	59.8	55.2, 64.5	192	66.2	59.5, 72.8
40	165	54.9	47.3, 62.5	131	71.0	63.2, 78.8
Ethnicity						
White, non-Hispanic	4,443	57.9	56.4, 59.3	1,234	61.0	58.3, 63.7
Hispanic, white	211	45.9	39.1, 52.7	24	58.3	38.6, 78.1
Black	252	47.2	41.0, 53.4	39	56.4	40.9, 72.0
Others	164	48.1	40.1, 55.9	29	65.5	48.2, 82.8
Education						
<High school graduate	579	52.1	48.0, 56.2	104	49.0	39.3, 58.7
High school, some college	2,865	54.8	53.0, 56.6	732	60.0	56.4, 63.5
College graduate	1,396	61.5	59.0, 64.1	474	65.2	60.9, 69.5
Household income						
<$20,000	934	42.4	39.2, 45.5	148	46.6	38.6, 54.7
$20,000	3,504	60.7	59.1, 62.3	1,101	63.1	60.3, 66.0
Health insurance						
Yes or Canadian	4,125	61.1	59.6, 62.5	1,188	64.8	62.1, 67.5
No	861	36.1	32.9, 39.3	174	36.7	29.4, 44.0
Perceived health						
Excellent	1,162	61.1	58.3, 63.9	389	67.1	62.4, 71.8
Very good	1,905	59.2	57.0, 61.4	576	59.7	55.7, 63.7
Good	1,444	52.4	49.8, 55.0	348	57.5	52.3, 62.7
Fair	432	50.1	45.4, 54.9	47	51.1	36.8, 65.4
Poor	79	45.6	34.6, 56.6	6	50.0	10.0, 90.0
Interval from diagnosis						
5–9 years	171	60.0	52.6, 67.4		NA	
10–14 years	1,370	57.8	55.2, 60.5		NA	
15–19 years	1,830	58.0	55.7, 60.3		NA	
20–24 years	1,372	55.7	53.1, 58.4		NA	
25–29 years	340	46.3	41.0, 51.6		NA	
Cancer diagnosis						
Leukemia	1,472	57.0	54.4, 59.5		NA	
CNS	642	61.7	57.9, 65.5		NA	
Hodgkin's disease	884	56.9	53.6, 60.2		NA	
Non-Hodgkin's lymphoma	613	56.1	52.2, 60.1		NA	
Wilms	290	51.2	45.4, 57.0		NA	
Neuroblastoma	193	56.3	49.3, 63.4		NA	
Soft tissue sarcoma	470	56.3	51.8, 60.8		NA	
Bone	519	53.0	48.7, 57.3		NA	

records to confirm the cancer diagnosis and record treatment information. Copies of the questionnaire and the medical record abstraction form are available online at www.cancer.umn.edu/ccss.

A total of 20,276 eligible patients were identified, and 14,054 survivors participated, which represents 69 percent of those potentially eligible or 81 percent of those successfully contacted. The current report includes the

9,535 of these 14,054 participants who were at least aged 18 years when interviewed.

A sibling cohort was also recruited by identifying 5,857 siblings of cancer survivors who were randomly selected for participation; 3,585 (62%) siblings had completed the questionnaire at the time of analysis. From the sibling cohort, 2,916 were aged 18 years or older at the time of interview and were included in this analysis.

Subjects were asked, "How long has it been since you last went to a dentist?," with responses of less than 1 year ago, 1–2 years ago, 3–4 years ago, 5 or more years ago, and never.

Comparisons of dental utilization within strata of independent variables and between survivors and the sibling comparison group were assessed by calculating binomial proportions with 95 percent confidence intervals (95% CI). Because previous studies have suggested differential dental utilization patterns between males and females, we conducted analyses stratified by sex (14,15). To determine the strength of association between the dental utilization variable and the demographic and cancer-related factors hypothesized to be significant *a priori* (age, ethnicity, education, income, and health insurance status), multivariate models were constructed to estimate odds ratios (OR) with 95 percent confidence intervals (CI). To account for potential within-family correlation between the survivor and his/her sibling from the same family, variances were calculated using generalized estimating equations for correlated data (16).

Results

Overall, 60.4 percent of survivors reported a dental visit within the last year, 23.0 percent reported one to two years ago, 8.7 percent reported three to four years ago, 7.4 percent reported five or more years ago, and 0.6 percent report never having had a dental visit.

Table 1 describes the percentage of adult long-term survivors of childhood cancer and the comparison group of siblings who reported dental visits within the last year with respect to sociodemographic and cancer-related factors. Overall, there was no significant difference between female survivors and the female sibling comparison group in the likelihood of visiting a dentist within one year, but male siblings were significantly more likely to report a recent visit than male survivors. Female survivors were significantly more likely than male survivors to report a recent visit when comparing the groups overall, and within certain subgroups: survivors aged 25 to 39 years; non-Hispanic whites; survivors with higher levels of educational attainment; survivors with health insurance; and those whose perceived health was good, very good, or excellent.

TABLE 2
Multivariate Risk Factors Predicting Use of Dental Services* Among Adult Survivors of Childhood Cancer

	Women		Men	
	Odds Ratio	95% CI	Odds Ratio	95% CI
Age at interview (years)				
18–24	1.00	Reference	1.00	Reference
25–29	0.72	0.61, 0.85	0.60	0.52, 0.69
30–34	0.88	0.74, 1.06	0.73	0.62, 0.86
35–39	0.96	0.76, 1.20	0.85	0.68, 1.06
≥40	0.94	0.65, 1.37	0.69	0.49, 0.96
Race/ethnicity				
White, non-Hispanic	1.00	Reference	1.00	Reference
Hispanic, white	0.57	0.43, 0.76	0.71	0.53, 0.95
Black	0.64	0.49, 0.84	0.74	0.57, 0.97
Others	0.83	0.55, 1.24	0.72	0.52, 0.99
Education				
<High school graduate	0.53	0.41, 0.68	0.76	0.62, 0.95
High school/some college	0.61	0.52, 0.71	0.79	0.69, 0.91
College graduate	1.00	Reference	1.00	Reference
Health insurance				
No	0.38	0.32, 0.45	0.38	0.32, 0.44
Yes or Canadian	1.00	Reference	1.00	Reference
Head/neck radiation				
No	1.00	Reference	1.00	Reference
Yes	1.00	0.87, 1.14	1.27	1.12, 1.44

*Dental visit last year.

Multivariate analyses describing the dental utilization practices of survivors are shown in Table 2. These analyses were adjusted for age, ethnicity, education, health insurance status, concern for future health, and cranial radiation therapy. The dental utilization by survivors exposed to cranial radiation is also shown in Table 2. Overall, 44.8 percent of the survivors received head or neck radiation therapy. Although female survivors exposed to cranial radiation were not significantly more likely than other female survivors to have reported a dental visit within the last year, males were 27 percent more likely to report a recent dental visit than male cancer survivors not treated with cranial radiation (OR 1.27; 95% CI=1.12, 1.44).

No significant difference between survivors and siblings was seen in the likelihood of visiting a dentist within the last year, after adjusting for age, ethnicity, education, income, and health insurance (females OR=1.05, 95% CI=0.92, 1.19; males OR=0.91, 95% CI=0.80, 1.03).

Discussion

Our data provide evidence that the dental utilization practices among young adult survivors of childhood cancer are below recommended levels. Overall, only 60 percent of survivors reported a dental visit within the last year. Survivors' dental practices did not differ from a comparison group of siblings, and utilization levels reflected national data (15,17-21). This occurs even though all survivors, and especially those exposed to head and neck radiation therapy, are at increased risk of dental abnormalities. Only male survivors who were ex-

posed to cranial radiation, compared with male survivors not exposed to cranial radiation, reported a slightly increased likelihood of a recent dental visit.

The groups less likely to report recent dental visits included: minority subjects, subjects with low levels of educational attainment, subjects with annual household incomes of <$20,000, and those who lacked health insurance. These findings are consistent with other important sources of dental utilization data, including: the 1989 and 1993 National Health Interview Surveys (NHIS), the Third National Health and Nutrition Examination Survey (NHANES III) (16), and other studies examining predictors of dental utilization (15,18-21).

Inadequate dental utilization practices may have important dental health consequences on survivors of childhood cancer. For example, radiation therapy to the head and neck may produce salivary gland dysfunction with a resultant inferior quality and quantity of saliva, which predisposes survivors to dental caries and periodontal disease (22). While microdontia, hypodontia, root stunting, and enamel dysplasia are potential long-term complications of therapy for all survivors, those who were treated at an early age (generally age 8 years or younger), or treated with cranial radiation or intense chemotherapy, are at even greater risk (4,5,23). These potential long-term effects of therapy cause not only cosmetic problems, but also functional problems. They may affect a person's ability to eat, their food choices, the way they communicate, or their self-image, any of which may result in a reduced quality of life.

This study has several limitations that should be considered when interpreting the results. Self-reported data on dental visits and the validity of these reports have not been determined. However, our findings mirror those of both NHIS and NHANES. We did not obtain information on the purpose of the reported dental visit or the regularity of dental visits, so we cannot assess the adequacy of respondents' overall dental care practices. We did not obtain information on whether respondents had any form of dental insurance, and instead used health insurance as a surrogate. Dental insurance is usually provided as an employee benefit, and it would be unusual for survivors to have dental coverage without health insurance. It has been estimated that the number of people lacking dental insurance is 2.5 times the number who lack health insurance (24).

Conclusions

Currently, dental visits by childhood cancer survivors appear below recommended levels, even among the highest risk groups. Several groups of survivors are less likely to report recent dental visits, including minority subjects, subjects with low levels of educational attainment, subjects with low annual household incomes, and especially those who lack health insurance. Primary care physicians and dentists who see childhood cancer survivors could provide benefit to their patients by informing them about potential late effects of therapy, assessing dental care utilization, and recommending regular dental surveillance.

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