Strategies for Tobacco Control Among Youngsters with Cancer

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Objective To examine smoking rates, discuss risk factors for smoking onset, and summarize the success of smoking trials conducted to date with youngsters treated for cancer. **Methods** Studies selected from the published pediatric literature on smoking in young cancer patients were summarized to illustrate the progress in tobacco control in this vulnerable population. **Results** Children with cancer report smoking at rates that are lower than or comparable to those of their healthy peers, depending on their treatment status. The few smoking trials conducted with youngsters with cancer have yielded modest effects. **Conclusions** The timing, intensity and duration of smoking interventions for children with cancer in the medical setting have not been adequately explored. Identification of intermediate biomarkers that are predictive of later morbidity is necessary to demonstrate the short-term impact of smoking trials. Simultaneous implementation of many levels of intervention will enhance tobacco control efforts for youngsters with cancer.

Key words cancer; pediatrics; smoking; tobacco control.

Tobacco use is the leading preventable cause of illness and death in the United States and its adverse health effects have been well documented (McGinnis & Foege, 1993; USDHHS, 2000). Cigarette smoking is the most typical form of tobacco use among adolescents (Centers for Disease Control and Prevention [CDC], 2001) with over 90% of adult smokers engaging in smoking before age 19 (Mowery, Brick, & Farrelly, 2000). The initiation of smoking behaviors in adolescence is associated with even more dramatic health risks in later adulthood (Peto, 1994; USDHHS, 1994). Consequently, tobacco prevention and early intervention efforts are critical during childhood and adolescence, before life-long smoking habits are established.

Disease and treatment-related complications that accompany a diagnosis of childhood cancer are likely to be magnified by cigarette smoking, thereby increasing the child's risk for adverse health problems. Antineoplastic therapies currently used in the treatment of pediatric cancer are associated with cardiopulmonary toxicities and organ compromise that affect pulmonary, respiratory, and cardiovascular functioning. Acute complications of smoking can include damage to the patient's protective airway cilia, predisposing the immunosuppressed patient to respiratory infections due to compromised mucosal damage (USDHHS, 1994). Young patients treated with cardiopulmonary agents (O'Driscoll et al., 1990) and/or thoracic radiation may develop restrictive lung disease (Benoist, Lemerle, & Jean, 1982) and cardiac problems (Lipshultz et al., 1991) that can be exacerbated by smoking. In addition to cardiopulmonary dysfunction, the youngster's risk for developing second malignancies may be increased if he/she uses tobacco. Consequently, tobacco prevention and early intervention efforts are critical to reduce morbidity and mortality in this vulnerable population.

Smoking Prevalence

Collective results across several studies suggest considerable variability in documented smoking rates among children and adolescents treated for cancer. Treatment status may affect whether youngsters with cancer choose to engage in smoking behaviors or not. Estimates of smoking rates reported in individual studies should be interpreted with caution as they are based on small sample sizes and varying definitions of smoking status. The few published studies that examined smoking rates among young cancer patients undergoing active treatment

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at the time of the smoking assessment found that <10% of adolescents were self-reported smokers (Tyc, Lensing, Klosky, Rai, & Robinson, 2005; Tyc et al., 2004). In one study of youngsters aged 12–18 years, Tyc and colleagues (2005) found that only 2.2% of 90 adolescents treated for cancer reported current smoking compared to ~22% of 279 similarly aged adolescents without cancer. Current smokers were defined as those who had smoked a cigarette in the past 30 days. The low smoking rates reported among young cancer patients were attributed to the patient's medical status and the relative recency of their diagnosis. The percentage of former smokers was similar between adolescents with cancer (20%) and those without cancer (18%).

In a related study of 94 preadolescents, aged 8–11 years, and recently diagnosed with cancer, none admitted to smoking, with very low smoking rates (<1%) reported among 403 preadolescents without cancer of similar age (Tyc, Klosky, Lensing, Throckmorton-Belzer, & Rai, 2006, unpublished manuscript). A similarly low percentage of past smokers were reported between preadolescents with cancer (2.2%) and without cancer (3.6%). These low rates of current smoking are generally consistent with those of other published studies examining smoking behaviors among elementary school students in the same age range (Johnson et al., 2002; Simons-Morton & Haynie, 2003).

The low smoking rates of youngsters undergoing treatment for cancer are not unlike those reported for other medically at-risk pediatric patients (Tyc & Throckmorton-Belzer, 2006). With the exception of children and adolescents with asthma who report smoking at rates comparable to or greater than those reported for youngsters without this condition, those with cancer, cystic fibrosis, sickle cell disease, and juvenile rheumatoid arthritis have been reported to smoke at similarly reduced rates relative to their healthy peers. A direct comparison of smoking rates across different pediatric groups is complex, however, because of the differences in the demographic composition of the samples studied, as well as the ways in which smoking status is defined.

In comparison to young cancer cohorts in active treatment, higher smoking rates that more closely resemble those of their healthy peers have been reported among adolescent survivors who have completed treatment. Studies have reported that between 15% and 38% of adolescent survivors are current smokers (Hollen & Hobbie, 1993; Mulhern et al., 1995; Tyc, Hadley, & Crockett, 2001; Verrill, Schafer, Vannatta, & Noll, 2000), while 13–53% had tried cigarettes (Hollen & Hobbie, 1993, 1996; Mulhern et al., 1995; Tyc et al., 2003). These rates are comparable to national surveys that report that 14–29% of high school-aged students are current smokers and ~64% who have experimented with smoking (Allen et al., 2003; CDC, 2002). Differences in reported smoking rates across studies may reflect whether or not the parent was present at the time the child completed the smoking assessment. Unlike national surveys that are typically completed by students in the classroom setting, it is not clear whether smoking assessments completed by youngsters with cancer in the medical setting are done so in the presence of the parent, which may affect the reliability of reported results.

Among survivors who reach young adulthood, smoking prevalence rates have been documented to range from 17% to 29% for current smoking (Bellizi, Rowland, Jeffery & McNeel, 2005; Denmark-Wahnefried et al., 2005; Emmons et al., 2002; Haupt et al., 1992; Larcombe, Mott, & Hunt, 2002; Meacham et al., 2005; Mulhern et al., 1995; Tao et al., 1998) and between 23% and 57% have tried cigarettes (Emmons et al., 2002; Haupt et al., 1992; Tao et al., 1998). Data from the Childhood Cancer Survivor Study, which is based on the largest research cohort of adult survivors ever assembled in the US, showed that 17% of 5-year survivors ≥18 years of age were current smokers. Using the National Health Interview survey, Bellizi and colleagues (2005) reported that 20.2% of cancer survivors reported current smoking. Forty-three percent of the younger survivors in the cohort, 18–40 years of age, were smokers. Based on these collective studies, the smoking rates for survivors appear to be comparable to those reported among adults in the general population (CDC, 2005), despite their elevated medical vulnerabilities.

Risk Factors

A number of variables derived from major psychosocial models have been identified to explain smoking onset and progression in adolescents (Chassin, Presson, & Sherman, 1990; Choi, Harris, Okuyemi, & Ahluwalia, 2003). These variables have included knowledge (Pederson, Koval, McGrady, & Tyas, 1998), perceived health risk (Choi et al., 2003), perceived value of smoking (Robinson, Klesges, Zbikowski, & Glaser, 1997), social influences (Flay et al., 1994; Tercyak, Peshkin, Walker, & Stein, 2002; Wang, Fitzhugh, Westerfield, & Eddy, 1995), rebelliousness (Burt, Dinh, Peterson, & Sarason, 2000; Pederson et al., 1998; Tyas & Pederson, 1998), and numerous others. The complexity of factors

contributing to adolescent smoking is further compounded by differences in age, gender, race, and socioeconomic status (Robinson & Klesges, 1997). However, little is known about what motivates youngsters with cancer to smoke and how more well-established smoking risk factors operate in the context of a diagnosis and treatment for cancer.

Intentions to smoke, sometimes referred to as susceptibility to smoking, has been used as a proximal measure in adolescent smoking research and shown to be a significant predictor of later smoking behavior (Pierce, Choi, Gilpin, Farkas, & Merritt, 1996). Tyc and colleagues (2005, 2006) recently reported that nonsmoking adolescents and preadolescents with cancer were significantly less likely to report future intentions to smoke than youngsters without cancer. More importantly, 48% and 14% of adolescents and preadolescents with cancer, respectively, reported some intentions to smoke cigarettes in the future and, therefore, may be at risk for establishing lifelong smoking habits (Tyc et al., 2005, 2006).

These same studies also reported that predictors of intentions to smoke were similar among adolescents and preadolescents with and without cancer (Tyc et al., 2005, 2006). Tobacco-specific variables (e.g., peer and parent smoking, knowledge, and instrumental value of smoking) better predicted intentions to smoke than more general psychosocial variables (e.g., optimism and rebelliousness). Differences in the relationship between various risk factors and intentions to smoke in adolescents and preadolescents suggested that factors that influence smoking may change developmentally and some factors may be more salient for a given age group. A limitation of these studies was that only traditional risk factors were examined and the influence of variables unique to the cancer experience on the youngster's decision to smoke was not considered.

Parent and peer smoking have been consistently identified as strong predictors of adolescent smoking behaviors (Flay et al., 1994; Tercyak et al., 2002; Turner, Mermelstein, & Flay, 2004; Wang et al., 1995). Recent evidence suggests that social influences do not differentially affect smoking outcomes for adolescents and preadolescents with and without cancer (Tyc et al., 2005, 2006). The finding that peer smoking did not significantly impact intentions to smoke among youngsters with cancer suggests that they may not view smoking as a way to reconnect with their peers and/or seek peer approval, despite being removed from their peer social networks for extended time periods due to treatment. Having more smokers in the social network, however, has been associated with fewer quit attempts and greater nicotine dependence among young adult cancer survivors who smoke (Emmons et al., 2003).

There is considerable evidence supporting an association between depression and cigarette smoking in adolescents. Some studies have indicated that adolescents who report depression and anxiety symptoms are at greater risk for smoking initiation than their asymptomatic peers (Breslau, 1995; Covey, Glassman, & Stetner, 1998; Jorm et al., 1999; Patton et al., 1998), while others have reported that smoking may predict later depressive symptoms (Goodman & Capitman, 2000; Wu & Anthony, 1999). Thus, the direction of the relationship between smoking and depression status is not clear. Although some investigators suggest that youngsters with cancer report low levels of affective distress (Elkin, Phipps, Mulhern, & Fairclough, 1997; Frank, Blount & Brown, 1997; Phipps & Srivastava, 1997), those who exhibit depressive symptoms may be vulnerable to becoming addicted to nicotine and/or those who smoke may be at risk for later psychological symptoms. Although additional research is necessary to better understand the association between adolescent depression and smoking, addressing and adolescent's affective distress may be an important component of smoking prevention and cessation programs.

A relationship between attention problems and ADHD with smoking has more recently been demonstrated in published studies. Youngsters with ADHD appear to be at greater risk for tobacco use than their peers without ADHD (Aytaclar, Tarter, Kirisci, & Lu, 1999; Burke, Loeber, & Lahey, 2001; Kollin, McClernon, & Fuemmeler, 2005; Lambert & Hartsough, 1998; Milberger, Biederman, Faraone, Chen, & Jones, 1997; Tercyak, Lerman, & Audrain, 2002; Whalen, Jamner, Henker, Delfino, & Lozano, 2002) and engage in earlier experimentation (Milberger et al., 1997) and earlier onset of regular smoking (Lambert & Hartsough, 1998) than their counterparts without ADHD. Adolescents with more severe ADHD symptomatology report stronger urges to smoke (Kollins et al., 2005; Whalen et al., 2002). Symptoms of inattention also appear to be strongly associated with an increased likelihood of smoking (Aytaclar et al., 1999; Burke et al., 2001). Consistent with a self-medication model, the stimulant property of nicotine is known to improve attention and is reinforcing, leading to the development of regular smoking behavior (Kassel, 1997). Given that children with cancer often experience attention problems as a consequence of CNS

treatment that resemble the symptoms of their ADHD peers (Butler & Mulhern, 2005), they may be similarly inclined to engage in smoking. Treating the youngster's attention problems may serve to reduce their propensity to later tobacco use.

Although youngsters with cancer and survivors report greater concerns about health protection than their healthy counterparts (Mulhern et al., 1995; Tyc et al., 2005, 2006), secondary to their cancer treatment, their practice of smoking behaviors has not been consistently influenced by these heightened risk perceptions. Higher perceived vulnerability to tobacco-related health risks has, however, been shown to predict readiness to quit smoking and confidence in one's ability to quit (e.g., self-efficacy) among young adult cancer survivors (Emmons et al., 2003). Other cognitive variables such as poor decision making and reduced problem solving have been identified as significant predictors of one or more risky health behaviors, including tobacco use, among adolescent survivors of cancer (Hollen & Hobbie, 1996).

Treatment-related variables have also been demonstrated to influence the initiation and maintenance of the young adult survivor's smoking habits (Emmons et al., 2002). For example, a reduction in risk of smoking onset has been observed among survivors with CNS malignancies who received cranial radiation therapy (CRT). Survivors who received CRT and smoked were also less likely to stop smoking. Frequency of smoking among adult cancer survivors has not been found to be influenced by prior exposure to treatments associated with pulmonary, cardiac, or vascular complications (Emmons et al., 2002). Whether treatment and disease-related variables impact the trajectory of smoking among adolescents with cancer has not been adequately documented. Such findings raise the question of whether young survivors are sufficiently aware of their health risks as impacted by their treatment histories.

Interventions

Clinician-delivered Interventions

To date, few controlled smoking trials have been conducted with youngsters treated for cancer. Utilizing the Health Belief Model as a theoretical framework (Weinstein, 1993), Tyc and colleagues (2003) demonstrated that a brief behavioral tobacco-based risk counseling intervention could increase tobacco-related knowledge and perceived vulnerability to tobacco-related health risks as well as decrease intentions to use tobacco among adolescent cancer survivors. In this study, a total of 103 adolescent cancer survivors, aged 10–18 years, who were at least 1 year off treatment, were randomized to a standard care control (SCC) group or a tobacco intervention (TI) group. Patients in the SCC group were asked about tobacco use, advised about tobacco-related health risks, and encouraged to abstain from using tobacco. Patients assigned to the TI group received risk counseling focused on cancer late effects, participated in goal setting, viewed an educational video, and received literature, physician feedback, and telephone counseling at 1 and 3 months following the intervention. Significantly higher knowledge and perceived vulnerability scores and significantly lower intentions scores were obtained by patients who participated in the intervention, relative to the SCC group, 12 months following the intervention. Although a modest effect was demonstrated after a single brief provider-delivered session, a more intensive intervention delivered over several sessions may be necessary to enhance its impact. Results also indicated that nonsmoking adolescents who had used tobacco in the past, had parents who used tobacco and who perceived greater benefits from tobacco use, had reported higher intentions for future smoking. Additionally, the intervention was less effective in changing intentions among adolescents whose parents used tobacco.

Another interesting finding from this study was that significant changes between the intervention and control groups were not evident until 12 months after the intervention. The stronger intervention effects observed at 12 months versus a 6-month follow-up were inconsistent with traditional learning theory that would predict decay of intervention effects over time. The authors suggested that patients who received the intervention became more sensitized to social, environmental, and informational cues over time and better able to recognize the risks associated with tobacco use such that they decided not to use tobacco. Repeated anti-tobacco messages may, therefore, be necessary to modify an adolescent's perceived risk and intentions to use tobacco.

Using a similar approach, Hudson and colleagues (Hudson et al., 2002) failed to report significant change in knowledge, perceptions, and health behaviors 12 months following a clinician-delivered late effects counseling and health behavior training intervention for 272 adolescent cancer survivors attending a long-term follow-up clinic. Unlike the Tyc et al. (2003) study, which addressed only tobacco use, this health promotion trial targeted a variety of health behaviors selected by survivors, including sun protection, dietary fat and weight reduction, and regular exercise, in addition to

tobacco use. Earlier research also failed to demonstrate the efficacy of a clinician-delivered decision-making program in modifying risk motivation for smoking and self-reported smoking behaviors among a convenience sample of adolescents ($n = 64$), aged 13–21 years, who survived cancer (Hollen, Hobbie, & Finley, 1999). This program addressed tobacco use in addition to alcohol and illicit drug use. These collective findings suggest that although clinician-delivered approaches that counsel adolescents about healthy lifestyles offer promise, targeting tobacco use in combination with other health risk behaviors may dilute or dampen their effect.

Peer-Delivered Cessation Interventions

Peer-delivered counseling is one approach that has also been found to be effective in promoting cessation among young adult cancer survivors who smoke (Emmons et al., 2005). Results from a recent randomized trial showed that compared to a self-help group, a peer-delivered counseling group was twice as likely to quit smoking, as based on their self-report. The approach used in the study was unique in that it included telephone counseling delivered by a trained cancer survivor, tailored and targeted didactic materials, and free nicotine replacement therapy. Approximately 15% of participants who received the counseling intervention had quit by the 12-month assessment compared to 9% who received the self-help intervention. Peer outreach modalities may be similarly effective for adolescents who have been treated for cancer and smoke.

Research Directions

The limited smoking trials conducted with adolescents who have completed and survived their cancer treatment have focused largely on prevention with only modest significant effects. Only two of the three prevention trials employed randomized designs. No cessation studies have been published in adolescents with cancer. Collectively, findings suggest that clinician-delivered interventions that involve behavioral risk counseling have the potential to enhance the impact of minimal ask-and-advise approaches often implemented in the pediatric oncology setting to promote change in adolescent smoking behavior. The interventions that have been tested include information on treatment-related health risks and late effects and are designed to be brief and incorporated into routine medical care with periodic telephone follow-up. The power of the reported findings has been limited by the low intensity of intervention-based contact, issues related to study design, and small sample sizes.

While there has been limited demonstrated effect on reducing risks factors for smoking (e.g., knowledge and perceptions), studies have failed to demonstrate significant changes in smoking and other health behaviors. Observed differences in reduction of risk factors for smoking versus smoking/health behaviors in the three cited adolescent intervention studies may be partially accounted for by the smoking status of the adolescents enrolled on the trials as well as the aims of the studies. For example, in the Tyc et al. (2003) study, the majority of the sample was composed of self-reported nonsmokers (although smoking status was not biochemically verified), and the objective of the preventative intervention was to reduce participants' future intentions to smoke and promote tobacco abstinence. Whereas actual smoking is the ideal outcome in adolescent smoking research, smoking status was not targeted as an outcome in this 12-month study as impact on smoking behaviors may not be readily apparent for years. Additionally, the content of the intervention employed in this study was designed to specifically address the risk factors for smoking being assessed.

Although the other studies targeted similarly-aged adolescents who survived their cancer treatment and received a health promotion intervention of similar length, the interventions were directed toward modifying risk factors and/or reducing risk behaviors among adolescents who engaged in one or more risky health behaviors with little effect. Moreover, these samples also included adolescents who did not currently engage in specific risk behaviors, including smoking, but were targeted with the same intervention. Clearly, future smoking trials for adolescents with cancer should emphasize either prevention or cessation efforts, depending on the behavioral risk status of the adolescents to be studied.

To date, the reported smoking status of children and adolescents with cancer enrolled on smoking trials has relied on self-report, using varying definitions of smoking status. Smokers have generally been identified based on their use of cigarettes in the past month (Hudson et al., 2002; Tyc et al., 2003) or endorsement of current cigarette smoking (Hollen et al., 1999). The falsification rate of self-reports of smoking in cancer cohorts is largely unknown and likely to be high given the possible stigma associated with reporting smoking behaviors to health care providers in the medical setting. Biochemical verification of self-reported smoking as well

as standardized measures of smoking status and nicotine dependence are certainly warranted to better assess the magnitude of this health behavior problem in youngsters with cancer. Although definitions of smoking status for clinical trials may largely depend on the study objectives, measures of cigarette consumption that address number of cigarettes smoked per day over a 30 day period may most accurately define regular versus experimental smokers and provide useful information for intervention based on a single item. These same measures have been used to identify smoking status in large national adolescent smoking studies (Bachman, Wadsworth, O'Malley, Johnston & Schulenberg, 1997). A modified Fagerstrom Tolerance Questionnaire (Prokhorov, Pallonen, Fava, Ding, & Niaura, 1996), a 7-item measure of nicotine dependence that has been validated among adolescents, is also recommended for use in smoking studies.

Given the cross-sectional nature of reported data in published studies, smoking behavior rates prior to a youngster's diagnosis with cancer have not been examined. Consequently, it is difficult to determine if patients temporarily change or reduce their prediagnosis smoking behaviors secondary to their medical status and treatment-related factors. The findings from one study showed that a significant percentage of nonsmoking adolescents with cancer were past smokers, suggesting that a temporary reduction in smoking following diagnosis may be a possibility (Tyc et al., 2005). A thorough smoking history and a naturalistic study of longitudinal smoking patterns throughout a child's treatment course may shed some light on these issues.

A related issue that deserves further consideration is identification of the optimal time to intervene with young patients, when they will be most receptive to antitobacco messages. To date, study populations for smoking trials have relied solely on childhood cancer survivors who have completed treatment and attend long-term follow-up clinics in a medical setting (Hollen et al., 1999; Hudson et al., 2002; Tyc et al., 2003). The focus on survivors was based largely on the assumption that youngsters may be more willing to take action to change their smoking behaviors after completion of treatment, when the focus is on surveillance rather than eradication of disease. Alternatively, early intervention when patients are undergoing cancer therapy, particularly when combined with supportive services, traditionally offered to children with cancer, may serve to change, disrupt, or delay the trajectory of smoking. Support for early intervention requires the assumption that during cancer treatment, youngsters are highly sensitized to their health and more motivated to engage in behavioral change to minimize their health risks. In the absence of empirical evidence that identifies the optimal timepoint for intervention with children and adolescents, adult studies suggest there may be multiple teachable moments requiring multiple intervention efforts along the treatment continuum to keep nonsmokers and smokers motivated to maintain abstinence or to stop smoking, respectively (Cox, Africano, Tercyak, & Taylor, 2003). Future smoking trials should attempt to explore this neglected issue.

Although social influences on adolescent smoking have been widely documented (Tercyak et al., 2002; Turner et al., 2004; Wang et al., 1995), smoking intervention programs have not accounted for the social context of smoking behaviors among adolescents with cancer. The addition of peer support to smoking programs in the form of peer counselors has been reported to be to be beneficial for promoting cessation among young adult cancer survivors (Emmons et al., 2005), but has not been evaluated in adolescent smoking trials. Parents are another potential source of support for adolescents attempting to modify their smoking behavior. However, results from an earlier trial suggest that youngsters with cancer may respond differently to risk counseling about smoking, depending on the smoking status of the parent (Tyc et al., 2003). This raises the question as to whether parents and families who smoke provide support or interference with smoking intervention efforts directed towards youngsters with cancer, during a time when they themselves may not be able to abstain from smoking. Further research is needed to explore the possibility of family-focused smoking interventions, particularly since parents and family members may be more accessible during the child's medical care.

The interplay of parent and peer social influences with biological, environmental, cognitive, and psychological vulnerabilities for smoking behaviors should be more carefully examined within the context of the youngster's developmental stage. The developmental transition of youngsters is associated with behavioral and social milestones that are highly relevant to trajectories for smoking and different risk factors may play a more active role at different developmental stages (Jamner et al., 2003). How these developmental differences and age-related processes are further impacted by medical and cancer treatment-related influences that may serve to disrupt a youngster's social and physical development is a complex issue that is not fully understood.

Identification of the developmental course of smoking behaviors in young cancer patients may lead to the development of targeted and more effective interventions for this population.

Overall, published studies have also failed to quantify the effects of smoking on the health status of young cancer patients and select appropriate clinical outcomes for smoking trials that are necessary to demonstrate the impact of smoking interventions conducted in the medical setting. Short-term adverse events are relatively uncommon in cohorts of childhood cancer patients, particularly after contemporary risk-adapted therapies, and events exhibit a long latency from time of diagnosis and treatment to presentation in adulthood. Therefore, rigorous short-term measures of health status or intermediate biomarkers that predict later morbidity may be necessary to demonstrate the short-term impact for smoking trials. Valid treatment end points for smoking trials that are translated into decreased morbidity and mortality in this vulnerable population should be explored. If, for example, reduction of smoke intake decreases cancer-related morbidity, then lower smoking rates rather than total cessation (i.e., a harm reduction approach) may be a valid transitional outcome. However, there is a lack of clear empirical evidence to demonstrate how prevention and cessation efforts are impacted by harm-reduction approaches (Shiffman, Mason, & Henningfield, 1998). Identifying cost-effective strategies for maximizing accuracy of outcomes, particularly in large-scale smoking interventions, should be a priority for future studies.

As evidenced by this article, smoking interventions have generally been understudied in adolescents with cancer and no published studies have examined the efficacy of bupropion or nicotine replacement therapy (NRT) in this high-risk group. Although shown to enhance cessation rates in adult smokers (Fiore, Jorenby, & Baker, 1997; Hughes, Goldstein, Hurt, & Shiffman, 1999; Hurt et al., 1997), the number of pharmacotherapy trials conducted with adolescents has been limited. As a result, there is insufficient data to support the efficacy of pharmacological approaches and the application of pharmacotherapy among this age group. Yet, tobacco-dependent adolescents may experience withdrawal symptoms that are similar to those experienced by tobacco-dependent adults (Rojas, Killen, Haydel, & Robinson, 1998; Smith et al., 1996) and may benefit from pharmacological intervention. One open-label trial demonstrated a small reduction in withdrawal symptoms among adolescents with an 8-week use of nicotine replacement therapy (NRT) in the form of the nicotine patch, although no improvement was reported in long-term abstinence rates (Smith et al., 1996). Similarly, one study failed to detect significant effects for NRT patches and gum in supporting cessation versus placebo using 7-day and more prolonged abstinence outcomes among adolescents (Moolchan et al., 2005) and bupropion has not been demonstrated to be a useful adjunct to NRT (Killen et al., 2004). Pharmacological agents may be valuable treatment alternatives for highly nicotine-dependent adolescents with and without cancer and those with comorbid conditions such as depression and ADHD, which should be explored in future cessation studies.

Clinical Implications

From a clinical perspective, the treatment for cancer may provide an excellent opportunity for health care providers to encourage maintenance of smoking cessation for those smokers who temporarily reduce their smoking practices and to counsel nonsmoking patients to continue to abstain from smoking. A youngster's cancer treatment may, therefore, serve both an inhibitory function as well as a motivating one on his/her smoking behaviors that should be capitalized by health care providers. Greater efficacy in preventing smoking onset among youngsters with cancer may be achieved by also targeting those who clearly intend to smoke or those who are less firmly committed to future smoking abstinence.

Developmentally, smoking prevention should begin during preadolescence and prior to development of solidified smoking attitudes. Research in school settings has shown that students who initiate smoking prior to participation in middle school prevention programs have been unaffected by such programs (Ellickson, Bell, & McGuigan, 1993; Vartiainen, Pallonen, McAlister, & Puska, 1990). Therefore, early intervention prior to onset of smoking is important. Health care providers should play a significant role in communicating anti-smoking messages to their young patients at a likely early critical stage in their decision making about smoking.

Health counseling and communication about smoking and nicotine addiction by the health care provider may, however, need to be more tailored to the youngster's reasoning abilities about these topics. Miller and Armstrong (2006) recently reported that children's progression of conceptual reasoning about smoking and nicotine addiction were generally consistent with Piagetian stages of cognitive development and physical causality; children's concepts of smoking change as their

cognitive and social maturity increases. For example, young children may verbalize their understanding of the mechanics of smoking cigarettes but may not fully understand how addiction results from smoking. The social and emotional risks involved in nicotine addiction may be more salient to the adolescent who better understands issues of autonomy, loss of control, and choice associated with the neurobiological processes of addiction. Therefore, clinicians' use of developmentally appropriate strategies may improve the outcomes of prevention and cessation-based counseling efforts.

Within the medical setting, clinicians are often the primary source of reinforcement for a youngster's smoking behavior during their treatment and for that reason, should incorporate tobacco counseling at every medical visit. Clinical practice guidelines suggest that all children should be asked about their tobacco use and their intentions to smoke in the future, advised to stop or continue to abstain from smoking, assess their willingness to stop smoking if they smoke, assist with smoking cessation, and provided follow-up (Fiore et al., 2000). While clinicians may be able to elicit a behavioral change, albeit not immediately, ongoing sources of reinforcement from families and schools are necessary to maintain behaviors established during counseling, especially when youngsters are removed from the medical setting. Published studies indicate that combining interventions at multiple levels (e.g., family, schools, and community) appear to result in a greater reduction in the incidence of tobacco use among adolescents than any one single intervention program alone due to the multiple influences on adolescent smoking behavior (Perry, Kelder, Murray, & Klepp, 1992; Perry et al., 2003). Therefore, repeated smoking interventions across multiple settings and from multiple sources may be necessary to produce behavioral changes that are not readily apparent in the clinic setting.

One source that may be able to reinforce the antismoking messages delivered by the health care provider in the home is the child's family. Family-based smoking approaches, that include both parent and child components, have been recognized as a promising avenue for preventing adolescent tobacco use. Although the few randomized controlled trials that evaluated family-based programs have yielded minimal reduction in preadolescent and adolescent smoking onset in the general population at 12–20 month follow-ups (Bauman et al., 2001; Curry et al., 2003), other positive changes were observed. Modest increases in the rates of parent–child discussions about tobacco-related topics were reported (Bauman et al., 2001) and families were more likely to establish rules about tobacco use, provide encouragement not to smoke, and talk about peer and media influences on substance use (Curry et al., 2003). These programs, at minimum, provided mailed materials about smoking and telephone contacts delivered by health educators and targeted toward children and their family members. Such approaches may have even greater impact among families with children treated for cancer if initiated by the child's health care provider. Regular access to the child and family members during medical visits would allow health care providers to capitalize on the parent/family–child interaction and promote more dialogue around smoking. Given the positive association between environmental smoke exposure, primarily from parental sources, and youth smoking behaviors (Holden, Hund, Gable, & Mowery, 2003), both primary prevention and secondary exposure components should be included in family-based approaches.

While consistency and repeatability of the anti-tobacco message is critical, the intensity or dosage of intervention that is maximally effective for youngsters with cancer is not clear. A dose–response has been reported in some studies suggesting that more counseling episodes have been associated with lower rates of smoking than when fewer sessions are employed (Emmons et al., 2005; Hovell & Slymen, 1996). For children with cancer for whom elevated health risks are a concern, smoking trials that incorporate counseling over longer periods or a greater number of sessions than have been previously tested may have some value. Whether children and their families can tolerate the burden involved in long-term or repeated counseling programs, while concurrently dealing with treatment demands, is an area worth exploring. Dosage of intervention must also be weighed within the context of time constraints of program delivery within a medical setting. To better study dosage effects, more expensive and longer community trials may be necessary.

In addition to dosage issues, the degree of tailoring of the intervention to account for individual as well as disease- and treatment-related differences that influence adolescent smoking should be considered. Results from the work of Tyc and her colleagues (2005, 2006) have suggested that smoking prevention programs built on traditional tobacco-specific and psychosocial risk factors for healthy adolescents may be similarly applicable to the young patient treated for cancer. However, revisions to the content and delivery, as well as reliance on the supportive and motivational aspects of the treatment setting, may be necessary to enhance the impact of more

traditional school- and family-based approaches, when used with children and adolescents with cancer. Additionally, youngsters with cancer should be informed about acute and chronic complications of smoking during and after treatment in the context of their individualized treatment plan, and their increased health vulnerability relative to their healthy peers (Tyc, Hudson, Hinds, Elliott, & Kibby, 1997).

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References

Allen, J. A., Vallone, D., Haviland, M. L., Healton, C., Farrelly, M. C., Husten, C. G., et al. (2003). Tobacco use among middle and high school students-United States, 2002. *Morbidity and Mortality Weekly Report, 52*, 1096–1098.

Aytaclar, S., Tarter, R. E., Kirisci, L., & Lu, S. (1999). Association between hyperactivity and executive cognitive functioning in childhood substance use in early adolescence. *Journal of the American Academy of Child and Adolescent Psychiatry, 38*, 172–178.

Bachman, J. G., Wadsworth, K. N., O'Maalley, P. M., Johnston, L. D., & Shulenberg, J. (1997). *Smoking, drinking, and drug use in young adulthood: The impact of new freedoms and new responsibilities*. Hillsdale, NJ: Erlbaum.

Bauman, K. E., Foshee, V. A., Ennett, S. T., Pemberton, M., Hicks, K. A., King, T. S., et al. (2001). The influence of a family program on adolescent tobacco and alcohol use. *American Journal of Public Health, 91*, 604–610.

Bellizzi, K. M., Rowland, J. H., Jeffery, D. D., & McNeel, T. (2005). Health behaviors of cancer survivors: Examining opportunities for cancer control intervention. *Journal of Clinical Oncology, 23*, 8884–8893.

Benoist, M. R., Lemerle, J., & Jean, R. (1982). Effects on pulmonary function of whole lung irradiation for Wilm's tumor in children. *Thorax, 37*, 175–180.

Breslau, N. (1995). Psychiatric comorbidity of smoking and nicotine dependence. *Behavioral Genetics, 25*, 95–101.

Burke, J. D., Loeber, R., & Lahey, B. B. (2001). Which aspects of ADHD are associated with tobacco use in early adolescence? *Journal of Child Psychology and Psychiatry, and Allied Disciplines, 42*, 493–502.

Burt, R. D., Dinh, K. T., Peterson, A. V., & Sarason, I. G. (2000). Predicting adolescent smoking: A prospective study of personality variables. *Preventive Medicine, 30*, 115–125.

Butler, R. W., & Mulhern, R. K. (2005). Neurocognitive intervention for children and adolescent surviving cancer. *Journal of Pediatric Psychology, 30*, 65–78.

Centers for Disease Control and Prevention (2001). CDC Surveillance Summaries, November 2, 2001. *Morbidity and Mortality Weekly Report*, *50* (No. SS–4), 961–972.

Centers for Disease Control, and Prevention (2002). *Morbidity and Mortality Weekly Report, 51*, 409–412.

Centers for Disease Control, and Prevention (2005). Cigarette smoking among adults. *Morbidity and Mortality Weekly Report, 54*, 509–513.

Chassin, L., Presson, C. C., & Sherman, S. J. (1990). Social psychological contributions to the understanding and prevention of adolescent cigarette smoking. *Personality and Social Psychology Bulletin, 16*, 133–151.

Choi, W. S., Harris, K. J., Okuyemi, K., & Ahluwalia, J. S. (2003). Predictors of smoking initiation among college-bound high school students. *Annals of Behavioral Medicine, 26*, 69–74.

Covey, L. S., Glassman, A. H., & Stetner, F. (1998). Cigarette smoking and major depression. *Journal of Addictive Diseases, 17*, 35–46.

Cox, L. S., Africano, N. L., Tercyak, K. P., & Taylor, K. L. (2003). Nicotine dependence treatment for patients with cancer. *Cancer, 98*, 632–644.

Curry, S. J., Hollis, J., Bush, T., Polen, M., Ludman, E. J., Grothaus, L., et al. (2003). A randomized trial of a family-based smoking prevention intervention in managed care. *Preventive Medicine, 37*, 617–626.

Denmark-Wahnefried, W., Werner, C., Chipp, E. C., Guill, A. B., Bonner, M., Jones, L. W., et al. (2005). Survivors of childhood cancer and their guardians. *Cancer, 103*, 2171–2180.

Elkin, T. D., Phipps, S., Mulhern, R. K., & Fairclough, D. (1997). Psychological functioning of adolescent and young adult survivors of pediatric malignancy. *Medical and Pediatric Oncology, 29*, 582–588.

Ellickson, P. L., Bell, R. M., & McGuigan, K. A. (1993). Prevention adolescent drug use: Long-term results of a junior high program. *American Journal of Public Health, 83*, 856–861.

Emmons, K. M., Butterfield, R. M., Puleo, E., Park, E. R., Mertens, A., Gritz, E. R., et al. (2003). Smoking among participants in the childhood cancer survivors

cohort: The Partnership for Health Study. *Journal of Clinical Oncology, 21*, 189–196.

Emmons, K., Li, F., Whitton, J., Mertens, A. C., Hutchinson, R., Diller, L., et al. (2002). Predictors of smoking initiation and cessation among childhood cancer survivors: A report from the Childhood Cancer Survivor Study. *Journal of Clinical Oncology, 20*, 1608–1616.

Emmons, K. M., Puleo, E., Park, E., Gritz, E. R., Butterfield, R. M., Weeks, J. C., et al. (2005). Peer-delivered smoking counseling for childhood cancer survivors increases rates of cessation: The Partnership for Health Study. *Journal of Clinical Oncology, 23*, 6516–6523.

Fiore, M. C., Bailey, W. C., Cohen, S. J., Dorfman, S. F., Goldstein, M. G., Gritz, E. R., et al. (2000). *Clinical practice guideline: Treating tobacco use and dependence. Quick reference guide for clinicians*. Rockville, MD: US Department of Health and Human Services, Public Health Service.

Fiore, M., Jorenby, D., & Baker, D. (1997). Smoking cessation: Principles and practices based upon the AHCPR Guideline, 1996. Agency of Health Care Policy and Research. *Annals of Behavioral Medicine, 19*, 213–219.

Flay, B. R., Hu, F. B., Siddiqui, O., Day, L. E., Hedeker, D., Petraitis, J., et al. (1994). Differential influence of parental smoking and friends' smoking on adolescent initiation and escalation of smoking. *Journal of Health and Social Behavior, 35*, 248–265.

Frank, N. C., Blount, R. L., & Brown, R. T. (1997). Attributions, coping, and adjustment in children with cancer. *Journal of Pediatric Psychology, 22*, 563–576.

Goodman, E., & Capitman, J. (2000). Depressive symptoms and cigarette smoking among teens. *Pediatrics, 106*, 748–755.

Haupt, R., Byrne, J., Connelly, R. R., Mostow, E. N., Austin, D. F., Holmes, G. R., et al. (1992). Smoking habits in survivors of childhood and adolescent cancer. *Medical and Pediatric Oncology, 20*, 301–306.

Holden, D. J., Hund, L. M., Gable, J. M., & Mowery, P. (2003). *Legacy First Look Report 11. Youth tobacco cessation: Results from the 2000 National Youth Tobacco Survey*. Washington, DC: American Legacy Foundation.

Hollen, P. J., & Hobbie, W. L. (1993). Risk taking and decision making of adolescent long-term survivors of cancer. *Oncology Nursing Forum, 20*, 769–776.

Hollen, P. J., & Hobbie, W. L. (1996). Decision-making and risk behaviors of cancer-surviving adolescents and their peers. *Journal of Pediatric Oncology Nursing, 13*, 121–134.

Hollen, P. J., Hobbie, W. L., & Finley, S. M. (1999). Testing the effects of a decision-making and risk-reduction program for cancer-surviving adolescents. *Oncology Nursing Forum, 26*, 1475–1486.

Hovell, M. F., & Slymen, D. J. (1996). An adolescent tobacco-use prevention trial in orthodontic offices. *American Journal of Public Health, 86*, 1760–1767.

Hudson, M. M., Tyc, V. L., Srivastava, D. K., Gattuso, J., Quargnenti, A., Crom, D. B., et al. (2002). Multi-component behavioral interventions to promote health protective behaviors in childhood cancer survivors: the Protect Study. *Medical and Pediatric Oncology, 39*, 2–11.

Hurt, R. D., Sachs, D. P., Glover, E. D., Offord, K. P., Johnston, J. A, Dale, L. C., et al. (1997). A compariosn of sustained-release bupropion and placebo for smoking cessation. *New England Journal of Medicine, 337*, 1195–1202.

Hughes, J. R., Goldstein, M. C., Hurt, R. D., & Shiffman, S. (1999). Recent advances in the pharmacotherapy of smoking. *Journal of the American Medical Association, 281*, 72–76.

Jamner, L. D., Whalen, C. K., Loughlin, S. E., Mermelstein, R., Audrain-McGovern, A., Krishnan-Sarin, S., et al. (2003). Tobacco use across the formative years: A road map to developmental vulnerabilities. *Nicotine & Tobacco Research, 5*, S71–S87.

Johnson, C. C., Li, D., Perry, C. L., Elder, J. P., Feldman, H. A., Kelder, S. H., et al. (2002). Fifth through eighth grade longitudinal predictors of tobacco use among a racially diverse cohort: CATCH. *Journal of School Health, 72*, 58–64.

Jorm, A. F., Rodgers, B., Jacomb, P. A., Christensen, H., Hendersen, S., & Korten, A. E. (1999). Smoking and mental health results from a community survey. *Medical Journal of Australia, 170*, 74–77.

Kassel, J. D. (1997). Smoking and attention: A review and reformulation of the stimulus-filter hypothesis. *Clinical Psychology Review, 17*, 451–478.

Killen, J. D., Robinson, T. N., Ammerman, S., Hayward, C., Rogers, J., Stone, C., et al. (2004). Randomized clinical trial of the efficacy of bupropion combined with nicotine patch in the treatment of adolescent smokers. *Journal of Consulting and Clinical Psychology, 72*, 729–735.

Kollin, S. H., McClernon, F. J., & Fuemmeler, B. F. (2005). Association between smoking and

attention-deficit/hyperactivity disorder symptoms in a population-based sample of young adults. *Archives of General Psychiatry, 62*, 1142–1147.

Lambert, N. M., & Hartsough, C. S. (1998). Prospective study of tobacco smoking and substance dependencies among samples of ADHD and non-ADHD participants. *Journal of Learning Disabilities, 31*, 533–544.

Larcombe, I., Mott, M., & Hunt, L. (2002). Lifestyle behaviors of young adult survivors of childhood cancer. *British Journal of Cancer, 87*, 1204–1209.

Lipshultz, S. E., Colan, S. D., Gelbar, R. D., Perez-Atayde, A. R., Sallan, S. E., & Sanders, S. P. (1991). Late cardiac effects of doxorubicin therapy for acute lymphoblastic leukemia in childhood. *New England Journal of Medicine, 324*, 808–815.

McGinnis, J. M., & Foege, W. H. (1993). Actual causes of death in the United States. *Journal of the American Medical Association, 270*, 2207–2212.

Meacham, L. R., Gurney, J. G., Mertens, A. C., Ness, K. K., Sklar, C. A., Robison, L. L., et al. (2005). Body mass index in long-term adult survivors of childhood cancer. *Cancer, 103*, 1730–1739.

Milberger, S., Biederman, J., Faraone, S. V., Chen, L., & Jones, J. (1997). ADHD is associated with early initiation of cigarette smoking in children and adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry, 36*, 37–44.

Miller, K. L., & Armstrong, M. (2006). Developmental concepts of nicotine addiction. *Journal of Pediatric Nursing, 21*, 108–114.

Moolchan, E. T., Robinson, M. L., Ernst, M., Cadet, J. L., Pickworth, W. B., Heishman, S. J., et al. (2005). Safety and efficacy of the nicotine patch and gum for treatment of adolescent tobacco addiction. *Pediatrics, 115*, 407–414.

Mowery, P. D., Brick, P. D., & Farrelly, M. C. (2000). *Legacy First Look Report 3. Pathways to established smoking: Results from the 1999 National Youth Tobacco Survey*. Washington, DC: American Legacy Foundation.

Mulhern, R. K., Tyc, V. L., Phipps, S., Crom, D., Barclay, D., Greenwald, C., et al. (1995). Health-related behaviors of survivors of childhood cancer. *Medical and Pediatric Oncology, 25*, 159–165.

O'Driscoll, B. R., Hasleton, P. S., Taylor, P. M., Poulter, L. W., Gattamaneni, H. R., & Woodcock, A. H. (1990). Active lung fibrosis up to 17 years after chemotherapy with carmustine (BCNU) in childhood. *New England Journal of Medicine, 323*, 378–382.

Patton, G. C., Carlin, J. B., Coffey, C., Wolfe, R., Hibbert, M., & Bowes, G. (1998). Depression, anxiety, and smoking initiation: A prospective study over 3 years. *American Journal of Public Health, 88*, 1518–1522.

Pederson, L. L., Koval, J. J., McGrady, G. A., & Tyas, S. L. (1998). The degree and type of relationship between psychosocial variables and smoking status for students in grade 8: Is there a dose response relationship? *Preventive Medicine, 27*, 337–347.

Perry, C. L., Kelder, S. H., Murray, D. M., & Klepp, K. I. (1992). Community-wide smoking prevention: Long-term outcomes of the Minnesota heart health program and the class of 1989 study. *Journal of Public Health, 82*, 1210–1216.

Perry, C. L., Komro, K. A., Veblen-Mortenson, S., Bosma, L. M., Farbakhsh, K., Munson, K. A., et al. (2003). A randomized controlled trial of the middle and junior high school D.A.R.E. and D.A.R.E. Plus programs. *Archives of Pediatric and Adolescent Medicine, 157*, 178–184.

Peto, R. (1994). Smoking and death: The past 40 years and the next 40. *British Medical Journal, 309*, 937–939.

Phipps, S., & Srivastava, D. K. (1997). Repressive adaptation in children with cancer. *Health Psychology, 16*, 521–528.

Pierce, J. P., Choi, W. S., Gilpin, E. A., Farkas, A. J., & Merritt, R. K. (1996). Validation of susceptibility as a predictor of which adolescents take up smoking in the United States. *Health Psychology, 15*, 355–361.

Prokhorov, A. V., Pallonen, U. E., Fava, J. L., Ding, L., & Niaura, R. (1996). Measuring nicotine dependence among high-risk adolescent smokers. *Addictive Behaviors, 21*, 117–127.

Robinson, L. A., & Klesges, R. C. (1997). Ethnic and gender differences in risk factors for smoking onset. *Health Psychology, 16*, 499–505.

Robinson, L. A., Klesges, R. C., Zbikowski, S. M., & Glaser, R. (1997). Predictors of risk for different stages of adolescent smoking in biracial sample. *Journal of Consulting and Clinical Psychology, 65*, 653–662.

Rojas, N., Killen, J., Haydel, K., & Robinson, T. (1998). Nicotine dependence among adolescent smokers. *Archives of Pediatric and Adolescent Medicine, 152*, 151–156.

Shiffman, S., Mason, K. M., & Henningfield, J. E. (1998). Tobacco dependence treatments: Review and prospectus. *Annual Review of Public Health, 19*, 335–358.

Simons-Morton, B. G., & Haynie, D. L. (2003). Psychosocial predictors of increased smoking stage among sixth graders. *American Journal of Health Behavior, 27*, 592–602.

Smith, T. A., House, R. F., Croghan, I. T., Gauvin, T. R., Colligan, R. C., Offord, K. P., et al. (1996). Nicotine patch therapy in adolescent smokers. *Pediatrics, 98*, 659–667.

Tao, M. L., Guo, M. D., Weiss, R., Byrne, J., Mills, J. L., Robison, L. L., et al. (1998). Smoking in adult survivors of childhood acute lymphoblastic leukemia. *Journal of the National Cancer Institute, 90*, 219–225.

Tercyak, K. P., Lerman, C., & Audrain, J. (2002). Association of attention-deficit/hyperactivity disorder symptoms with levels of cigarette smoking in a community sample of adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry, 41*, 799–805.

Tercyak, K. P., Peshkin, B. N., Walker, L. R., & Stein, M. A. (2002). Cigarette smoking among youth with attention-deficit/hyperactivity disorder: Clinical phenomenology, comorbidity and genetics. *Journal of Clinical Psychology in Medical Settings, 9*, 35–50.

Turner, L., Mermelstein, R., & Flay, B. (2004). Individual and contextual influences on adolescent smoking. *Annals of the New York Academy of Sciences, 1021*, 175–197.

Tyas, K. P., & Pederson, L. L. (1998). Psychosocial factors related to adolescent smoking: A critical review of the literature. *Tobacco Control, 7*, 409–420.

Tyc, V. L, Hadley, W., & Crockett, G. (2001). Prediction of health behaviors in pediatric cancer survivors. *Medical and Pediatric Oncology, 37*, 42–46.

Tyc, V. L., Hudson, M. M., Hinds, P., Elliott, V., & Kibby, M. Y. (1997). Tobacco use among pediatric cancer patients: Recommendations for developing clinical smoking interventions. *Journal of Clinical Oncology, 15*, 2194–2204.

Tyc, V. L., Klosky, J. L., Lensing, S. L., Throckmorton-Belzer, L., & Rai, S. N. (2006). A comparison of tobacco-related risk factors between preadolescents with and without cancer. Manuscript submitted for publication.

Tyc, V. L., Lensing, S. L., Klosky, J. L., Rai, S. N., & Robinson, L. (2005). A comparison of tobacco-related risk factors between adolescents with and without cancer. *Journal of Pediatric Psychology, 30*, 359–370.

Tyc, V. L., Rai, S. N., Lensing, S., Klosky, J. K., Stewart, D. B., & Gattuso, J. (2003). Intervention to reduce intentions to use tobacco among pediatric cancer survivors. *Journal of Clinical Oncology, 21*, 1366–1372.

Tyc, V. L., & Throckmorton-Belzer, L. (2006). Smoking rates and the state of smoking interventions for children and adolescents with chronic illness. *Pediatrics, 118*, e471–487.

Tyc, V. L., Throckmorton-Belzer, L., Klosky, J. L., Greeson, F. L., Lensing, S., Rai, S., et al. (2004). Smoking among parents of pediatric cancer patients and children's exposure to environmental tobacco smoke. *Journal of Child Health Care, 8*, 288–300.

U.S. Department of Health and Human Services (USDHHS). (1994). *Preventing tobacco use among young people: A report of the Surgeon General*. Atlanta, GA: USDHHS, Public Health Service, Centers for Disease Control, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health.

U.S. Department of Health and Human Services (USDHHS). *Healthy people 2010: Understanding, and improving health* (2nd ed.). Washington, DC: U.S. Government Printing Office.

Vartiainen, E., Pallonen, U., McAlister, A. L., & Puska, P. (1990). Eight-year follow-up results of an adolescent smoking prevention program: The North Karelia Youth Project. *American Journal of Public Health, 80*, 78–89.

Verrill, J. R., Schafer, J., Vannatta, K., & Noll, R. B. (2000). Aggression, antisocial behavior, and substance abuse in survivors of pediatric cancer: Possible protective effects of cancer and its treatment. *Journal of Pediatric Psychology, 25*, 493–502.

Wang, M. Q., Fitzhugh, E. C., Westerfield, R. C., & Eddy, J. M. (1995). Family and peer influences on smoking behavior among American adolescents: An age trend. *Journal of Adolescent Health, 16*, 200–203.

Weinstein, N. D. (1993). Testing four competing theories of health-protective behavior. *Health Psychology, 12*, 324–333.

Whalen, C. K., Jamner, L. D., Henker, B., Delfino, R. J., & Lozano, J. M. (2002). The ADHD spectrum and everyday life: Experiences sampling of adolescent moods, activities, smoking, and drinking. *Child Development, 73*, 209–227.

Wu, L., & Anthony, J. C. (1999). Tobacco smoking and depressed mood in late childhood and early adolescence. *American Journal of Public Health, 89*, 1837–1840.