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Smoking Cessation Interventions in Cancer Care: Opportunities for Oncology Nurses and Nurse Scientists

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Abstract

Smoking cessation is essential after the diagnosis of cancer to improve clinical outcomes. The purpose of this chapter is to provide a systematic review of research on smoking cessation in the context of cancer care with an emphasis on nursing contributions to the field. Data sources included research reports of smoking cessation interventions conducted in people with cancer. Nineteen primary studies were reviewed. High intensity interventions, targeting multiple behaviors, and/or using a multicomponent intervention that included pharmacotherapy, behavioral counseling, and social support were characteristics of the most successful treatments for tobacco dependence. The majority of interventions were conducted in adults with smoking-related malignancies during acute phases of illness. The most striking finding was that more than one half of the studies tested the efficacy of nurse-delivered interventions. Conceptual and methodological issues that can be improved in future studies include: using theoretical frameworks to specify how the intervention will affect outcomes, ensuring adequate sample sizes, using biochemical verification to monitor smoking outcomes, and using standardized outcome measures of abstinence. Although effective interventions are available for healthy populations, further research is needed to determine if tailored cessation interventions are needed for patients with cancer. To provide optimal quality care it is imperative that delivery of evidence-based smoking cessation interventions be integrated into the cancer treatment trajectory. Multiple barriers, including patient and nurse attitudes toward smoking and lack of knowledge related to tobacco treatment, prevent translating evidence-based tobacco dependence treatment into clinical practice. Further nursing research is needed to address these barriers.

Keywords

smoking cessation; tobacco dependence treatment; nursing interventions; oncology nursing

Smoking cessation is one of the most important interventions to prevent cancer and is also essential after the diagnosis of cancer to improve clinical outcomes. A growing body of literature identifies the devastating effects associated with continued tobacco use after the diagnosis of cancer, which include lower survival, recurrent disease, decreased efficacy of cancer treatment, increased treatment-related complications, increased physical symptoms, and reductions in quality of life (Fox, Rosenzweig, & Ostroff, 2004; Gritz, Dresler, & Sarna, 2005; Jensen, Jensen, & Grau, 2007; Videtic et al., 2003).

The purpose of this chapter is to provide a systematic review of current research on smoking cessation in the context of cancer care with a special emphasis on nursing contributions to the field. The first part of the chapter provides background information on the prevalence of

smoking among cancer patients and potential challenges associated with preventing smoking relapse. The second part of the chapter presents the methods that were used to conduct this systematic review. Subsequently, the results of the review are presented with a focus on the effectiveness of smoking cessation interventions for people with cancer, conceptual and methodological issues associated with smoking cessation studies in cancer care, and predictors of continued smoking among people with cancer. Finally, the discussion addresses the unique contributions of nursing, lessons learned from previous studies, and identifies directions for future research.

BACKGROUND

Smoking Prevalence Rates in Cancer Patients

Smoking prevalence rates at the time of diagnosis have been estimated to vary from 45% to 75% (Cox, Africano, Tercyak, & Taylor, 2003). Through a systematic review of studies, Cox and colleagues determined that 14% to 58% of patients who smoked at diagnosis continue to smoke after cancer treatment. The large variation in smoking prevalence rates may be related to a time lag when the various studies were done, as smoking prevalence rates have decreased among the general U.S. population, differences in methodologies used to measure smoking among the studies (e.g., self-report vs. biochemical verification), and/or the fact that many of the studies describing smoking behaviors in cancer patients have been conducted among heterogeneous groups of cancer patients (Cooley et al., 2007; Cox et al., 2003; Centers for Disease Control and Prevention, 2007).

Little information is available on how smoking rates vary among cancer sites and whether cancer site, stage, and type of cancer treatment influence cessation rates (Cox et al., 2003). Some recent studies, however, have examined the frequency of smoking among more homogeneous groups of patients. For example, two recent studies (Cooley et al., 2009; Walker et al., 2006) examined smoking behaviors after curative surgery for early stage lung cancer and found that the frequency of smoking at the time of diagnosis was 37% and that by 2 months after surgery 42% of smokers relapsed back to smoking. Another study examined smoking behaviors in adults who were childhood cancer survivors and found that 28% of the sample reported ever smoking and 17% continued to smoke (Emmons et al., 2003). Taken together, the studies examining smoking behaviors among cancer patients identify that smoking rates are as high if not higher than the general population. Given the profound effect that continued smoking has on decreasing the effectiveness of cancer treatment, smoking cessation interventions are critical in this patient population.

Challenges Associated With Smoking Cessation After the Diagnosis of Cancer

Although the diagnosis of cancer provides a unique opportunity for health care providers to enhance health promoting behaviors such as smoking cessation, it may be difficult for many patients to quit and stay quit because of the highly addictive nature of nicotine. It is important for both nurses and patients to recognize that tobacco dependence is a chronic illness that often requires repeated cessation attempts in order to be successful (Steinberg, Schmelzer, Richardson, & Foulds, 2008).

It often takes smokers many quit attempts before they are successful (Fiore et al., 2008). Moreover, cancer patients often face challenges associated with maintaining abstinence (Gritz et al., 2006). One common challenge is that many cancer patients may experience increased psychological distress including depression, anxiety, or increased stress, which often makes quitting smoking more difficult especially if the underlying condition is not recognized and treated. An additional consideration is there may be smokers within their social support network making long-term abstinence difficult. They may be highly addicted to nicotine and thus may experience severe withdrawal symptoms, if pharmacological cessation aides are not adequately utilized.

Guilt and shame over continued smoking are common and underscore the complex nature of addressing tobacco treatment within this subgroup of patients (Chapple, Ziebland, & McPherson, 2004). Several studies have identified that lung cancer patients often feel stigmatized because lung cancer tends to be associated with previous smoking (Chapple et al., 2004; Wassenaar et al., 2007). A recent study by LoConte, Else-Quest, Eickhoff, Hyde, and Schiller (2008) compared levels of guilt and shame among patients with nonsmall cell lung, prostate, and breast cancer. Results of the study identified that a history of previous smoking was associated with higher levels of guilt and shame among patients with all types of cancer. Thus, this study suggests that guilt and shame may not be a unique issue for patients with smoking-related malignancies but may also be an issue for smokers with other types of cancer. This finding is significant because it underscores that nurses must approach smokers with cancer with sensitivity and compassion when discussing smoking status and actively engage in efforts to minimize and diminish stigma associated with continued smoking after the diagnosis of cancer.

In order to optimize clinical outcomes, smoking cessation must be a critical component of the cancer care continuum from prevention of cancer through diagnosis, treatment, survivorship, and palliative care (Cooley, Sipples, Murphy, & Sarna, 2008). Many opportunities exist for oncology nurses to address smoking cessation for both cancer patients and their families. Effective smoking cessation interventions are available (Fiore et al., 2008). Moreover, it takes more than will power alone to achieve long-term cessation. The use of pharmacological cessation aides combined with behavioral counseling doubles the chances of successfully achieving long-term cessation (Fiore et al., 2008). However, most studies demonstrating effectiveness of treatment have been conducted within the general population and few studies have been conducted among cancer patients and their families (Gritz et al., 2005). A clear understanding of the current state of the science related to smoking cessation interventions in cancer care is necessary in order to provide optimal care and enhance long-term smoking cessation outcomes.

METHODS

The following section provides an overview of the methods that were used to conduct a systematic review of studies examining smoking cessation within the context of cancer care. We choose to focus on the entire spectrum of care so that we could identify whether smoking cessation interventions were conducted during and postcancer treatment and

whether studies considered contextual factors associated with quitting and relapse such as smoking within the social network.

Ganong's framework (1987) was used to guide this systematic literature review. This framework directs researchers to pose research questions to focus the review. Subsequently, search criteria are defined and explicit inclusion criteria are developed to guide the literature search. Once the relevant studies have been selected, the researchers examine the characteristics of the studies, identify relevant research findings, and interpret the results. The research questions included: (1) What is the current state of the science regarding the effectiveness of smoking cessation interventions in the context of cancer care? (2) What conceptual and methodological issues need to be addressed in future studies? (3) What are the predictors of continued smoking after the diagnosis of cancer? An article was included if it was found to be an empirical study with a smoking cessation intervention focus in the context of cancer care, directed toward patients or their social networks. Results were limited to English language papers. We searched the National Center for Biotechnology Information (NCBI) PubMed for empirical studies from January 1980 to April 2009. The search terms "cancer screening," "cancer patients," "patients with cancer," "cancer survivors," "smoking cessation intervention," "smoking cessation program," "smoking abstinence intervention," "smoking abstinence program," "smoking intervention," and "tobacco intervention." The bibliographies of identified articles were searched for additional studies.

Twenty-one articles met the inclusion criteria and are included in Table 10.1. Nineteen are primary intervention studies and are used as the n for the analysis; one of the articles reported long-term follow up on the intervention and another was a secondary analysis of the parent study (Cox, McLaughlin, Rai, Steen, & Hudson, 2005; Emmons et al., 2009). Once all of the relevant studies were identified, we gathered information on the theoretical framework, design, sample, type of intervention, measure used to evaluate smoking status, and selected findings.

Each article was assigned a quality rating using the Oncology Nursing Society's (ONS) evidence rating system (Ropka & Spencer-Cisek, 2001; Table 10.2). Studies were graded by two of the authors. Disagreements in ratings were discussed by the two graders to achieve consensus and a third grader was used to resolve any questions. Content analysis was then used to synthesize research findings. Studies were considered to be level 2 if the sample size was greater than 100, was a multisite trial, and a randomized clinical trial. The following section will discuss the results of the review.

RESULTS

Effectiveness of Smoking Cessation Interventions

Only two (2/19) of the studies (11%; Duffy et al., 2006; Emmons et al., 2005) reported statistically significant differences in smoking cessation outcomes between control and intervention groups, which favored the intervention group (Table 10.1). Duffy and colleagues (2006) tested a tailored smoking, alcohol, and depression intervention for head and neck cancer patients, and found that after 6 months, head and neck cancer patients

participating in the intervention group had significantly higher quit rates (47%) than those with usual care (31%, $p < .05$), which consisted of brief counseling, referrals, and print information. In the second study, Emmons and colleagues (2005) tested a peer-delivered smoking counseling intervention in childhood cancer survivors, entitled Partnership for Health, which consisted of six telephone calls, tailored materials, and free nicotine replacement and found that the intervention group reported significantly higher quit rates both at 8 (16.8% vs. 8.5%, $p < .01$) and 12 months (15% vs. 9%, $p = .01$) as compared to those in the control group, who received a physician's letter and cessation materials (Emmons et al., 2005). The effects of this intervention were found to be sustained at 2 to 6 years postbaseline such that quit rates at long-term follow-up were significantly higher in the peer-based telephone counseling group as compared to the self-help control group (20.6% vs. 17.6%; $p < .0003$; Emmons et al., 2009).

Three additional studies approached statistical significance and will be highlighted. Stanislaw and Wewers (1994) tested the effect of a structured smoking cessation intervention during hospitalization on short-term smoking abstinence in surgical cancer patients. The intervention group received a structured smoking cessation intervention during hospitalization, which consisted of three face-to-face visits, followed by five phone calls after discharge, whereas the control group received usual care. At 5 weeks postdischarge, 75% of the intervention group was abstinent as compared to 43% of the control groups ($p < .10$). The second study, conducted by Hollen, Hobbie, and Finley (1999), examined the effects of a decision-making and risk-reduction program for adolescent cancer survivors on smoking, alcohol, or illicit drug use. The intervention group attended a workshop that provided a health promotion program within the context of social support delivered by peers and health care providers as compared to a control group that did not attend the educational program. The effects of the intervention on smoking behavior were marginal at 6 months such that 16% of the control group were smoking at 6 months as compared to 10% of the intervention group ($p = .08$). The third study was a secondary analysis of a parent study that examined a multi-component behavioral intervention to promote health behaviors among adolescent cancer survivors (Hudson et al., 2002). Cox and colleagues (2005) examined each of the health behaviors separately rather than using a composite score and found that smoking abstinence at 12 months was maintained in the treatment group while decreasing in the control group ($p = .08$).

Delivery, Types, and Components of Effective Smoking Cessation Interventions

In order to gain a better understanding of the smoking cessation interventions that have been conducted within this population (Table 10.1), a brief overview of the delivery, types, and components of the interventions that enhanced smoking cessation outcomes and the samples that have been targeted in these interventions will be discussed.

Who Delivered the Interventions?—The smoking cessation interventions that were identified through this review were delivered by health care providers (12/19, 65%), tobacco treatment specialists and health educators (5/19, 25%), or peer counselors (2/19, 10%). Advanced practice nurses were among the most common health care provider (8/12, 67%) to deliver the smoking cessation intervention.

What Were the Components of the Interventions?—The type of smoking cessation interventions ranged from brief advice only, to counseling only, pharmacotherapy and counseling, or intensive interventions combining pharmacotherapy and counseling with other modalities (Table 10.1). The two studies that demonstrated significant differences between the groups used a multicomponent intervention that combined evidenced-based smoking cessation treatment with social support provided by peer counselors or treatment of comorbid conditions (depression and alcohol abuse) and cognitive behavioral therapy and medications delivered by advanced practice nurses (Duffy et al., 2006; Emmons et al., 2005).

Emmons and colleagues (2005) identified differences in quit rates depending on the number of counseling calls that each participant received for the 8-month follow-up such that there was an increase of 5% for those who received six calls compared with those who received five calls (29% vs. 24%). Similarly, those who used nicotine replacement treatment as part of the intervention had significantly higher quit rates than those who did not use nicotine replacement treatment ($p < .0001$).

Duffy and colleagues (2006) examined the effectiveness of the combined modality intervention among various subgroups and found that those treated for comorbid smoking and depression had higher smoking cessation rates compared with usual care, those treated for comorbid alcohol and depression had higher smoking and alcohol cessation rates compared with usual care and those treated for all three comorbidities had higher smoking cessation rates compared with usual care. Thus, the findings from this study suggest that using a multicomponent intervention to treat concomitant comorbidities improved smoking cessation rates among patients with cancers of the head and neck.

Who Received the Interventions?—The vast majority of studies (17/19, 89%) were conducted in adults with cancer and the remaining two (2/19, 11%) were conducted in adolescents with cancer (Table 10.1). Of the studies conducted in adults with cancer, 47% (8/17) were conducted in patients with smoking-related malignancies, which included lung or head and neck cancers. The remaining studies were conducted in heterogeneous samples of patients with cancer, or those with other illnesses such as cardiovascular disease, pulmonary disease, and/or those who underwent general surgery.

Interventions were conducted along most aspects of the cancer care continuum including prevention, (e.g., women undergoing cervical cancer screening or family members of cancer patients; 2/19, 11%), diagnosis and treatment (14/19, 74%), and survivorship (3/19, 15%). Besides the intervention by Schilling et al. (1997), which exclusively targeted family members of recently diagnosed cancer patients who smoked, only four other studies addressed smoking among participants' family members (Browning, Ahijevych, & Ross, 2000; Emmons et al., 2005; Sharp, Johansson, Fagerstrom, & Rutqvist, 2008; Wakefield, Olver, Whitford, & Rosenfeld, 2004). In the Wakefield and colleagues' study, patients' family members were made aware of the need to quit in support of the patient's quit attempt, while Emmons and colleagues provided NRT to subjects' partners—spouses who smoked and requested NRT. Although targeting family members was not an explicit goal of the Browning and colleagues' studies or the Sharp and colleagues' studies, family members

were able to participate in the intervention if they requested assistance with smoking cessation.

CONCEPTUAL AND METHODOLOGICAL ISSUES

Conceptual Issues

A theoretical framework was used to guide the vast majority of interventions ($n = 15/19$, 79%; Table 10.1). Combining frameworks was the most common approach ($n = 7/15$, 47%) followed by the Agency for Healthcare Research and Quality's four or five A's ($n = 3/15$, 20%), Prochaska's transtheoretical stages of change ($n = 2/15$, 13%), principles of motivational interviewing ($n = 1/15$, 7%), cognitive behavioral therapy ($n = 1/15$, 7%), or the health belief model ($n = 1/15$, 7%).

Methodological Issues

Quality of the Studies—As Table 10.1 illustrates, only about 40% ($n = 7/19$, 37%) of the intervention studies were rated as level 2 evidence, which indicates a strong quality of evidence. Methodological limitations that affected the quality of the studies were small sample size and/or weak study designs. Although a substantial proportion used a randomized controlled trial design ($n = 12/19$, 63%), many were plagued by small sample sizes. The number of participants among the various studies ranged from 13 to 1,077; 37% (7/19) of studies had sample sizes ≤ 100 , 42% (8/19) were >100 and ≤ 300 , and only 21% (4/19) were >300 .

Endpoints Used to Measure Tobacco Outcomes—The most common endpoints to measure tobacco outcomes were 7-day point prevalence at 6 ($n = 6/19$, 32%) and 12 ($n = 2/19$, 11%) months and continuous abstinence at 12 months (3/19, 16%). Only 47% of studies confirmed smoking cessation status through the use of cotinine, expired CO levels, or the bogus pipeline technique.

PREDICTORS OF SMOKING CESSATION OUTCOMES

Demographic Variables Associated With Smoking Cessation Outcomes

Gender, age, and educational level were reported to be associated with smoking cessation outcomes among head and neck cancer patients and childhood cancer survivors. Gritz and colleagues (1993) found that males were more likely to continue smoking after head and neck cancer. Similarly, Emmons and colleagues (2003) found that long-term smoking cessation outcomes were lower among male childhood cancer survivors. Both studies identified that age was associated with smoking outcomes. Gritz and colleagues (1993) identified that older participants were more likely to continue smoking compared to those who were younger. Similarly, Emmons and colleagues (2003) found that older age was associated with higher smoking rates among childhood cancer survivors. Socioeconomic status was also found to be associated with higher smoking rates among childhood cancer survivors such that survivors with lower socioeconomic status were more likely to continue smoking as compared to those with a higher socioeconomic status.

Illness-Related Variables Related to Smoking Cessation Outcomes

Type of illness, type of cancer treatment, and length of time since diagnosis also were associated with smoking cessation outcomes. Multiple studies found that patients with smoking-related malignancies (lung or head and neck cancer) were more likely to quit smoking as compared to those with other type of cancers, other types of chronic illness, or those undergoing general surgery. Gritz and colleagues (1993) found that patients with head and neck cancer who underwent surgical procedures were twice as likely to remain abstinent as compared to those who received radiation treatment. One potential reason for this difference may be that the types of surgical procedures used in the head and neck cancer group make smoking more physically difficult. Two studies found that patients with smoking-related malignancies (lung or head and neck cancer) who received smoking cessation interventions within 3 months of their diagnosis were more likely to be abstinent as compared to those who did not receive smoking cessation treatment within 3 months (Cox et al., 2003; Garces et al., 2004).

Psychosocial and Behavioral Factors Associated With Smoking Cessation Outcomes

A variety of psychosocial (depressive symptoms and smoking rates within the social network) and behavioral factors (motivational readiness to change, self-efficacy, level of nicotine dependence, and use of smoking cessation treatments) have been associated with smoking cessation outcomes. A discussion of the influence of these factors on smoking cessation outcomes are summarized in the following section.

Psychosocial Factors—Emmons and colleagues (2003) found that higher depressive symptoms as measured by the Brief Symptom Inventory 18 Severity Index were associated with higher smoking rates among childhood cancer survivors at entry to the Partnership for Health, a smoking cessation intervention for smokers in the childhood cancer survivors study. At 8- and 12-month follow-up, the Brief Symptom Inventory scores were associated with smoking cessation outcomes such that childhood cancer survivors with higher levels of depressive symptoms were less likely to quit smoking. Additionally, Emmons and colleagues (2003) identified that childhood cancer survivors who had smokers within their social network were more likely to be smokers and also more likely to be nicotine dependent. In fact, those with more smokers in their social network were twice as likely to be nicotine dependent as those with few smokers in their social network. This is an important issue as several studies identified that approximately 40%–50% of cancer patients lived with another smoker (Cox et al., 2003; Stanislaw & Wewers, 1994; Wakefield, Olver, Whitford, & Rosenfeld, 2004; Wewers, Jenkins, & Mignery, 1997).

Behavioral Factors—Studies have examined the relationship between motivational readiness to change smoking behavior and cessation outcomes in head and neck, lung cancer and childhood cancer survivors. Gritz and colleagues (1993) found that motivational readiness to change was associated with 12 month continuous abstinence rates among head and neck cancer patients such that 46% of precontemplators were abstinent at 12 months as compared to 59% of contemplators and 89% of those in the action stages of motivational readiness. In another study, Schnoll and colleagues (2003) found that cancer patients with a higher motivational readiness to quit smoking were more likely to be abstinent at 6 (*OR* =

2.9; 95% CI, 1.04 – 4.75) and 12 months ($OR = 1.76$; 95% CI, .94 – 3.30) after a brief physician initiated quit smoking intervention. Schnoll and colleagues also identified that having tried a group counseling cessation program ($OR = 3.48$; 95% CI, 1.66 – 6.98) was associated with smoking cessation outcomes in cancer patients who received a brief physician initiated quit smoking intervention at the 12-month follow-up. Schnoll and colleagues (2005) also examined predictors of smoking cessation among cancer patients who received a cognitive behavioral therapy intervention versus those who received basic health education and found that baseline motivational readiness for change was associated with smoking cessation at 1 month but was no longer significant at 3 months. Similarly, Emmons and colleagues (2005) found that baseline motivational readiness for change did not enter the final multivariate logistic regression model for smoking cessation outcomes in childhood cancer survivors at 8 and 12 months.

Self-efficacy or one's confidence in the ability to quit smoking was associated with enhanced smoking cessation. Emmons and colleagues (2009) identified that childhood cancer survivors with high self-efficacy at baseline were 4 times more likely to quit than those with little or no self-efficacy ($OR = 4.32$; 95% CI, 2.34 – 8.06) at 8 and 12 months. Situational self-efficacy or one's confidence in not smoking in a variety of situations was associated with smoking cessation at 2 to 6 years after baseline (Emmons et al., 2009).

Various measures of nicotine dependence level were associated with smoking cessation outcomes such that those with higher levels of nicotine dependence, as measured by smoking the first cigarette within 30 minutes of awakening, high levels of nicotine dependence on the Fagerstrom Nicotine Dependence Questionnaire, or smoking >15 cigarettes per day, were more likely to be smokers at follow-up assessments. One study found that use of pharmacotherapy enhanced smoking cessation outcomes. Emmons and colleagues (2005) found that childhood cancer survivors who used nicotine replacement treatment had significantly higher quit rates at the 12-month assessment as compared to nonusers ($p < .0001$). At long-term follow up of this study, tests of potential mediation effect on the intervention group determined that use of nicotine replacement treatment was the most significant variable that mediated the outcome of the intervention (Emmons et al., 2009).

DISCUSSION

One of the most remarkable findings of this systematic review is the leading role that nurses have played in delivering smoking cessation interventions in the context of cancer care studies. As Table 10.1 illustrates, more than half of the studies ($n = 10/19$, 53%) tested the efficacy of nurse-delivered interventions or nurses were the primary author of the published paper. Among the 12 studies that tested smoking cessation interventions delivered by health care providers, more than 2/3 (67%) of these studies used a nurse to deliver the intervention. One of the two studies that showed significant effects in promoting smoking cessation was a nurse-delivered intervention led by a nurse investigator (Duffy et al., 2006). Although this review indicates that studies addressed smoking cessation interventions along the cancer care continuum, the vast majority of interventions were conducted in adults with smoking-related malignancies during acute phases of illness in the treatment setting. Only two of the

studies examined in this review were conducted in cancer survivors (Emmons et al., 2005; Hudson et al., 2002) and only one was conducted within adolescents with cancer (Hollen, Hobbie, & Finley, 1999). These two groups of patients are particularly important to target for smoking cessation interventions in order to enhance clinical outcomes and promote long-term health. In particular, childhood cancer survivors are at high risk for late-term medical and psychosocial complications and provision of health promotion lifestyle counseling and regular screening may modify these effects (Nathan et al., 2009). Nathan and colleagues identified that many childhood cancer survivors engage in risky health behaviors (smoking, alcohol use, and physical inactivity) but do not receive adequate risk-based health care to modify their risks. In fact, although 90% of the childhood cancer survivors received medical care, less than 1 in 5 reported a visit in which they discussed ways that they can decrease their risks for development of cancer by altering risk behavior.

Lessons Learned

Taken together, synthesis of these studies provides lessons that can be used by oncology nurses and nurse scientists to create opportunities to advance care for cancer patients and their families and identifies avenues for future research. The three major lessons that may be gleaned from the studies conducted to date are (1) characteristics of successful smoking cessation interventions, (2) conceptual and methodological rigor that can be improved in future studies, and (3) understanding factors that are associated with improved smoking cessation outcomes.

Characteristics of Successful Smoking Cessation Interventions—All together, there were five smoking cessation interventions that had significant or marginally significant differences between the intervention and control group. It appears that the successful smoking cessation interventions within this population were characterized by high intensity interventions, interventions that had at least six sessions, targeted multiple risk behaviors and/or used a multicomponent intervention that included pharmacotherapy, behavioral counseling, and social support. In particular, social support seemed to be an important component of interventions delivered to childhood and adolescent cancer survivors. Many of these findings are consistent with recommendations from the U.S. Public Health Services clinical guideline for tobacco treatment (Fiore et al., 2008). For example, a strong dose-response relationship between treatment intensity and improved clinical outcomes and combining counseling with medication is more effective for smoking cessation than either approach used alone. Among smokers who wish to quit, Hughes (2008) recommends that health care providers take advantage of this window of opportunity and use an intensive approach to optimize chances for successful outcomes. This intensive approach may be especially salient among smokers with cancer, who are often highly motivated to quit and for whom smoking cessation after the diagnosis of cancer is essential to improve clinical outcomes. Future research is needed to assess whether more intensive interventions that routinely target multiple risk factors and use multicomponent interventions are needed to improve smoking cessation outcomes among cancer patients as compared to standard evidence-based smoking cessation interventions.

Need for Conceptual Rigor—Although the majority of studies used a theoretical framework to guide the intervention, few reported testing the theory. Rothman (2004) suggests that in order for us to advance our understanding of health behavior change and to advance innovation, intervention studies provide the opportunity to test theories and that data generated from this exercise can then be used to revise the theory and inform future interventions. One way to accomplish this is by having the theoretical framework specify how the intervention will affect clinical outcomes. Subsequently, a statistical test, called mediation analysis, can be used to test whether the smoking cessation intervention changes the variables they are designed to change, and test the theory regarding tobacco cessation outcomes (Judd & Kenny, 1981; MacKinnon, Taborga, & Morgan-Lopez, 2002). The type of approach discussed above is important for intervention research so that we can begin to understand how these third variables or mediators are related to tobacco use, understand how the smoking cessation program affects these mediating variables, and provide information on how the programs can be improved as well as revise the theory (Lipsey, 1993; MacKinnon et al., 2002). Emmons and colleagues (2003, 2005, 2009) provide an excellent example of how the use of a theoretical framework and mediation analyses can be used to guide the development and testing of smoking cessation interventions and advance knowledge of how, when, and for whom the intervention works.

Need for Methodological Rigor—Methodological issues that can be addressed in future studies are ensuring adequate sample sizes, use of biochemical verification to monitor smoking outcomes, and use of standardized outcome measures of abstinence. Many of the studies examined in this systematic review had small sample sizes, which limits the statistical power to detect intervention effects. Recruitment of smokers with cancer into clinical trials is challenging. Large numbers of patients must be screened in order to identify eligible participants. For example, Martinez and colleagues (2009) reported on the feasibility of enrolling cancer patients into smoking cessation clinical trials and found that out of 14,514 screened patients, 263 (<2%) were eligible; 43 (16%) refused enrollment. Among the eligible patients, 220 (84%) enrolled. This finding underscores the need to conduct multisite studies that keep inclusion criteria broad such that all smokers with cancer are eligible to participate except those at the end of life (De Moor, Elder, & Emmons, 2008).

Less than half of the studies used biochemical verification to determine smoking status. Biochemical verification of smoking status, with blood, salivary or urinary cotinine, or carbon monoxide is currently recommended when testing new interventions in special populations such as patients with smoking related diseases (Society for Research on Nicotine and Tobacco, 2002). It is not entirely clear whether biochemical verification is needed in all populations. For example, interventions that have low demand requirements such as large scale trials that have limited face-to-face contact and studies where data is collected through the mail, telephone, or internet may not need biochemical verification. However, for clinic-based studies, those which use higher intensity interventions and involve special populations, biochemical verification may add more precision in determining smoking cessation outcomes. Cooley and colleagues (2007) reported discrepancies between self-report and biochemical verification of smoking status in women with lung cancer such that current smoking status using biochemical verification was 20% higher than self-report.

Potential reasons for this discrepancy may be that continued smoking after the diagnosis of lung cancer is associated with guilt and shame and patients may be reluctant to disclose their smoking status (Chapple et al., 2004). It would be helpful for future studies to report smoking status using both self-report and biochemical verification so that we can clarify the utility of using both of these measures in clinical research.

The use of outcome measures of abstinence varied across the studies examined in this systematic review. The most common measure used was 7-day point prevalence at 6 months. Use of standardized measures across studies is recommended so that smoking cessation outcomes can be compared across various studies using a common metric. The most appropriate abstinence measure will vary depending on the type and purpose of the clinical trial. In general, Hughes and colleagues (2003) recommend that all smoking cessation trials report prolonged abstinence as the primary outcome measure plus 7-day point prevalence as the secondary measure because it can be biochemically confirmed and because it has frequently been used in previous trials and meta-analyses. In trials where smokers are willing to set a quit date, it is recommended that prolonged abstinence measures be reported at 6 and/or 12 months after the quit date, whereas in trials where smokers are not currently trying to quit, it is recommended that a prolonged abstinence measure 6-month duration be used and point prevalence rates at 6- and 12-month follow-up after the initiation of the intervention. Improving conceptual and methodological rigor in future studies will help us more clearly understand those interventions that are most useful in this population.

Understanding Factors Associated With Smoking Cessation Outcomes—

Understanding factors that are associated with smoking cessation outcomes among cancer patients are important so that future studies can use this information to inform the development of interventions. Potentially helpful targets are interventions that address the large numbers of smokers in the social network, motivational readiness to change smoking behavior, and self-efficacy. Zhou and colleagues (2009) examined factors that were associated with successful quit attempts and found that the use of cessation aides along with avoidance of other smokers were key strategies that quitters used to promote success. Given that many cancer patients, especially those with smoking-related malignancies, have a large number of smokers within their social networks, avoiding smokers is not a reasonable strategy. However, avoiding secondhand smoke is an important issue for patients after the diagnosis of cancer. Sarna and colleagues (2004) identified that lung cancer survivors who were exposed to secondhand smoke were 3 times as likely to report respiratory symptoms. In addition, increased respiratory symptoms were associated with decreased quality of life.

The diagnosis of cancer may be an ideal time to motivate both patients and their family members to initiate health changes such as smoking cessation (Emmons et al., 2005; McBride & Ostroff, 2003). Thus, developing and testing a family-based smoking cessation intervention may be a promising approach to promote behavioral change especially after the diagnosis of cancer. Interventions that target decreased exposure of patients to secondhand smoke are a potential option in the case that family members are not ready to quit smoking. One potential strategy to reduce patient exposure to secondhand smoke may be the use of household smoking bans. Shields (2007) examined the association between household smoking bans and smoking cessation outcomes and found that smokers who reported

smoking bans at home or work were more likely to quit smoking within the next 2 years. This is an area that deserves further study in the context of cancer care. Only one of the studies in this systematic review focused specifically on promoting smoking cessation among family members of cancer patients (Schilling et al., 1997). Although four other studies addressed smoking among participants' family members, none of these studies focused on the family as a unit for intervention or actively engaged family members to quit smoking as a primary part of the intervention (Browning et al., 2000; Emmons et al., 2005; Sharp et al., 2008; Wakefield et al., 2004). Future studies are needed to see if a family-based approach to promote smoking cessation is more effective than just targeting individuals with cancer.

It is interesting to note that the association between motivational readiness to change behavior and smoking cessation is mixed among these studies. Some studies indicated that motivational readiness to change was a factor that influenced cessation while other studies found that it wasn't a significant factor. The differences across studies may reflect that motivational readiness to change may be affected by the type of cancer, age of the patient, and length of time since diagnosis. For example, several studies identified that patients with smoking-related malignancies were much more likely to quit smoking as compared to those without smoking related malignancies (Smith, Reilly, Houston Miller, DeBusk, & Taylor, 2002; Wewers, Bowen, Stanislaw, & Desimone, 1994). Similarly, two studies identified that smokers who received smoking cessation interventions within 3 months of their diagnosis were more likely to quit smoking (Garces et al., 2004; Sanderson Cox et al., 2002). Thus, a better understanding of how motivation differs among various groups of cancer patients and how it changes over time would provide information that could be used to enhance and sustain motivation for quit attempts.

Another promising target in smoking cessation research is self-efficacy, which is defined as a person's confidence that they can successfully complete a certain task (Bandura, 1977). Incorporating strategies that increase self-efficacy seem to be important components to enhance smoking abstinence. Types of strategies that can be used to enhance self-efficacy in smoking cessation are use of peers that have been successful at quitting, coaching and practical advice about quit-ting, and the use of cessation aides to decrease withdrawal symptoms. The two studies in this review that have used peer-counseling focused on adolescent or childhood cancer survivors and these studies had positive or marginally positive results (Emmons et al., 2005; Hollen et al., 1999). Thus, testing the application of peer support and counseling among other populations of patients with cancer or at-risk for cancer is warranted.

Opportunities and Challenges for Oncology Nurses and Nurse Scientists

These findings underscore the enormous impact that nurses can make in advancing knowledge of smoking cessation interventions within the context of cancer care. Many opportunities exist for oncology nurses and nurse scientists to influence tobacco control. However, there are also significant barriers that must be addressed in order for oncology nurses to reach their full potential as leaders in tobacco control. The following section will highlight the opportunities and challenges that oncology nurses and nurse scientists face in

addressing smoking cessation, discuss lessons learned from the current state of the science related to smoking cessation intervention in cancer care and suggest future directions for research to advance tobacco control.

There is support from the nursing profession for further research in this area. For example, the Oncology Nursing Society's (ONS, 2006) position paper advocates for the involvement of nurses and nursing science to advance tobacco control. Nurses can participate in promoting tobacco control efforts through multiple channels, which include participating in professional education to enhance knowledge of tobacco treatment, enhancing public education materials, supporting local, state, and national legislative and regulatory efforts related to tobacco control, and furthering nursing research on tobacco prevention and cessation interventions.

As this review demonstrates further research is needed to evaluate the need for tailoring smoking cessation interventions in the context of cancer care, especially using nurses as interventionists. The findings of the efficacy of nurse intervention is further supported by the findings of a meta-analysis demonstrating that nursing interventions are effective to promote smoking cessation (Rice & Stead, 2009).

Relevant to this review are the findings of several studies indicating that attitudes toward providing smoking cessation advice influence nurses' behaviors. Hall and Marteau (2007) compared 152 nurses' reports of giving smoking cessation advice in the context of cervical cancer with their reports of giving advice for cardiovascular disease screening and diabetes care and their beliefs about providing advice in these three contexts. Results from this study revealed that nurses were more likely to give smoking cessation advice and had more positive beliefs about giving advice in the context of cardiovascular and diabetes care compared with cervical cancer screening. In another study, Sarna, Wewers, Brown, Lillington, and Brecht (2001) conducted a national survey with a random sample of oncology nurses and examined factors associated with barriers to providing tobacco treatment. Results from this study identified that nurses with the greatest number of barriers to providing smoking cessation were more likely to be current smokers, younger, less likely to have an advanced degree, to be a nurse practitioner, or to have administrative responsibilities. These two studies highlight potential barriers that must be overcome to increase the frequency with which nurses give smoking cessation advice as part of their practice.

Another significant challenge is the lack of information and skills for nurses to effectively deliver evidence-based tobacco treatment. Sarna and colleagues (2000) assessed the frequency of tobacco interventions among 1508 oncology nurses. Only 10% of the nurses were aware of the evidence-based tobacco treatment guideline (Fiore et al., 2008) published through the U.S. Public Health Service. The majority (64%) assessed and documented tobacco status, however, only 36% provided counseling, 24% recommended nicotine replacement, and 16% taught skills to prevent smoking relapse. Eighty-eight percent of nurses wanted to help their patients but 92% identified that they needed additional training. Evidence exists that nurses can be trained quickly to deliver smoking cessation interventions. For example, Borrelli, Lee, and Novak (2008) examined whether it was

possible to change nurse attitudes and counseling behaviors with a one-day training session. Results of this study showed that after the training nurses reported higher levels of self-efficacy to counsel, positive outcome expectancies, optimism that patients would follow their advice, and increased perceived importance of providing advice and increased perceived institutional support. In addition, nurses spent more time counseling smokers and were less likely to selectively counsel patients at 6 months after the training session.

CONCLUSION

As this systematic review reveals, there is a small but growing number of studies that examine smoking cessation interventions focused in the area of cancer care. Findings indicate that nurses have had a major role in the development, testing, and delivery of the smoking cessation interventions. Indeed, more than half of the studies tested the efficacy of nurse-delivered interventions. Moreover, among the 12 studies that tested smoking cessation interventions delivered by health care providers, about two thirds of these studies used a nurse to deliver the intervention. Although these findings are promising, further opportunities exist for nurses to expand their leadership in tobacco control in the context of cancer care. For example, most of the studies conducted to date have focused on adults with smoking-related malignancies receiving treatment in an acute care setting. Studies are needed that target other populations with cancer, including those at high risk for cancer, such as women undergoing cervical cancer screening, childhood cancer survivors, and adolescents with cancer. Further research is also needed on tobacco use of family members of patients diagnosed with cancer. Another area that is important to clarify is the specifics of which components of cessation interventions are most effective or those components that do not work during cancer care. This review demonstrates that, for people with cancer, high intensity interventions, targeting multiple risk behaviors and/or using a multi-component intervention that included pharmacotherapy, behavioral counseling, and social support characterized successful interventions. Using a theoretical framework to specify how the intervention is projected to affect outcomes, ensuring that adequate sample sizes are secured, using biochemical verification to monitor smoking outcomes, and using standardized outcome measures of abstinence are other strategies to advance the science. Finally, in order to improve translation of evidence into practice, research is needed to reduce barriers to nursing intervention.

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TABLE 10.1

Studies Evaluating Smoking Cessation Interventions in Cancer Care ($n = 21$)

Investigator	Conceptual Framework	Design	Sample	Intervention	Level of Training of Interventionist	Selected Findings	ONS Rating
Duffy et al., 2006	Cognitive behavioral therapy (CBT)	RCT	Head and neck cancer $n = 184$ 18 years of age	Targeting multiple risk factors (smoking, alcohol abuse, depression) Encouragement and support Advice/strategies for quitting NRT, bupropion, or antidepressants as needed	Nurses with CBT training Psychiatrist supervision	Self-reported smoking abstinence at 6 months was 47% in the intervention versus 31% in the usual care group ($p < .05$)	2
Emmons et al., 2005 ^a	Social ecological model and principles of motivational interviewing	RCT	Cancer 5 year survival <21 years old at diagnosis $n = 796$ 18 years old	Encouragement and support Smoking cessation materials Personalized messages and strategies for quitting Peer support NRT	Trained childhood cancer survivors	7-day pp at 8 and 12 months was 16.8% in the intervention versus 8.5% control group at 8 months and 15% versus 9 % at 12 months ($p < .01$) Bogus pipeline procedure for verification	2
Emmons et al., 2009 ^a	Social ecological model and principles of motivational interviewing	RCT	Cancer 5 year survival <21 years old at diagnosis $n = 796$ 18 years old	Encouragement and support Smoking cessation materials Personalized messages and strategies for quitting NRT	Trained childhood cancer survivors	7-day pp at 8 and 12 months and then 2 to 6 years postbaseline. Quit rates at long-term follow-up were 20.6% in intervention versus 17.6% in the control group ($p < .0003$)	2
Griz et al., 1993	Stages of change model	RCT	Head and neck cancer $n = 186$	Encouragement and support Smoking cessation materials Personalized messages and strategies for quitting	Physicians or dentists	Continuous abstinence rates at 12-month follow-up, verified with cotinine, were not significantly different between control group	2
McBride et al., 1999	Motivational interviewing techniques	RCT	Abnormal pap test in prior month, $n = 580$ 18 years old	Encouragement and support Smoking cessation materials Personalized message and strategies to quit smoking	Telephone counselors with 20 hours of training	Self-reported smoking at 6- and 15-month follow-up, no significant difference between usual care and self-help groups	2
Schnoll et al., 2003	AHRQ "5 A's"	RCT	Cancer patients $n = 432$ 19 years old	Brief advice Smoking cessation materials	Physicians	Self-reported 7-day pp smoking at 6- and 12-month follow-up was not different	2

Investigator	Conceptual Framework	Design	Sample	Intervention	Level of Training of Interventionist	Selected Findings	ONS Rating
Wakefield et al., 2004	Trans-theoretical model of change and motivational interviewing	RCT	Cancer diagnosis $n = 137$	Personalized message and strategies to quit smoking. Personalized message and strategies to quit smoking. Follow-up letter NRT Encouragement and support Smoking cessation materials Personalized message and strategies to quit smoking NRT	Trial coordinator	7-day pp at 3- and 6-month follow-up, verified by salivary cotinine or carbon monoxide, showed no differences found between intervention and control groups	2
Garces et al., 2004	None	QE	Head and neck cancer versus general population $n = 202$	Initial consultation Individualized treatment plan Phone follow up at 1,3, and 6 months, letter follow-up at 12 months NRT or bupropion	Tobacco treatment specialist	Self-reported 7-day pp at 6 months was 33% for head and neck cancer patients versus 26% for general population ($p = .30$)	5
Sanderson Cox et al., 2002	None	QE	Lung cancer versus nonlung cancer patients $n = 402$	Initial consultation Individualized treatment plan Phone follow up at 1,3, and 6 months, letter follow-up at 12 months NRT or bupropion	Tobacco treatment specialist	Self reported 7-day pp smoking at 6 months showed no significant difference between lung and nonlung cancer patients	5
Browning et al., 2000	AHRQ "4 A's"	QE	Lung cancer $n = 25$	Encouragement and support Smoking cessation materials Personalized messages and strategies for quitting NRT and bupropion encouraged, not provided	Advanced practice nurse	7-day pp abstinence at 6 months, confirmed with expired CO, was 71% for intervention versus 55% for controls ($p = .383$)	6
Cox et al., 2005 ^a	Health belief model	RCT	Cancer in remission 2 years $n = 267$ 12-18 years old	Multiple risk factors (i.e., tobacco, alcohol, diet, exercise) Encouragement and support Personalized messages and strategies for quitting	Physician or nurse practitioner	Self-reported smoking abstinence at 12 months remained consistent in the treatment group while decreasing in the control group ($p = .088$)	6
Griebel et al., 1998	None	RCT	Cancer $n = 28$ 19 years old	Encouragement and support Smoking cessation materials	Advanced practice nurse trained in tobacco treatment	7-day pp abstinence rates at 6 weeks postintervention, verified with cotinine, were 21% for intervention versus 14% usual care ($p = NS$)	6

Investigator	Conceptual Framework	Design	Sample	Intervention	Level of Training of Interventionist	Selected Findings	ONS Rating
<i>Hollen et al., 1999</i>	Conflict model of decision making, cognitive theory, and holistic concept of health	QE	Cancer diagnosis between birth and 12 years, disease free 5 $n = 64$	Personalized messages and strategies for quitting Personalized messages and strategies for quitting Multiple risk factors Encouragement and support Decision making materials Advice/strategies for quality decision making	Trained peers and health care professionals	Self-reported smoking behaviors at 1, 6, and 12 months found no significant difference between intervention and control groups ($p = .27, .08$, and $.22$, respectively)	6
Hudson et al., 2002 ^a	Health belief model	RCT	Cancer in remission 2 years $n = 267$, 12–18 years	Multiple risk factors (i.e., tobacco, alcohol, diet, exercise) Encouragement and support Personalized messages and strategies for quitting	Physician or nurse practitioner	Self-reported smoking at 12 months showed no significant differences between intervention and control group	6
Schilling et al., 1997	Trans-theoretical model of change	QE	Relative of cancer patients $n = 125$	Encouragement and support Smoking cessation materials Personalized message to quit smoking sent in a letter by mail	Physicians	Self-reported smoking cessation at 6 months was 9% among all relatives	6
Schnoll et al., 2005	Cognitive-social health information-processing model and CBT	RCT	Head, neck, or lung cancer $n = 109$ Smoking in past 30 days	Encouragement and support Smoking cessation materials Personalized message and advice to quit smoking NRT	Health educators	Self-reported 30-day pp smoking at 1- and 3-month follow-up, showed no differences between the intervention and health education groups	6
Sharp et al., 2008	Motivational interviewing and the AHRQ “5 A’s”	QE	Head or neck cancer $n = 50$	Encouragement and support Smoking cessation materials Advice/strategies for quitting NRT	Radiotherapy nurses	Continuous abstinence at 12 months (verified by carbon monoxide) was 51%	6
Smith et al., 2002	Self-efficacy theory and relapse prevention	QE	Hospitalized patients $n = 1077$ (124 with cancer)	Encouragement and support Smoking cessation materials Advice/strategies for quitting NRT as needed	Physicians, nurses	Self-reported 7-day pp at 12-month follow-up was 43% for general patients and 63% for cancer patients	6
Stanislaw & Wewers, 1994	None	RCT	Surgical oncology patients $n = 26$	Encouragement and support Smoking cessation and relaxation materials	Oncology clinical nurse specialists	Self-reported smoking at 5-week follow-up, verified by salivary cotinine, no difference in smoking between	6

Investigator	Conceptual Framework	Design	Sample	Intervention	Level of Training of Interventionist	Selected Findings	ONS Rating
Wewers et al., 1997	Social learning theory and addiction models	QE	Lung cancer <i>n</i> = 15	Advice/strategies for quitting Advice/strategies for quitting Encouragement and support Smoking cessation and relaxation materials Advice/strategies for quitting	Advanced practice nurse	experimental and control groups 7-day pp smoking at 6-week follow-up, verified by cotinine, showed that 40% of patients were abstinent	6
Wewers et al., 1994	National Cancer Institute's "4 A's"	RCT	Surgical patients <i>n</i> = 80 (30 cancer)	Encouragement and support Smoking cessation and relaxation materials Advice/strategies for quitting	Clinical nurse specialist	7-day pp smoking at 6-week follow-up, verified by cotinine, showed no differences between intervention and control groups	6

Note. Authors in **bold** = tested nurse delivered intervention. Authors in ***bold italics*** = principal investigator is a nurse. RCT = randomized clinical trial, QE = quasixperimental design, NRT = nicotine replacement therapy, pp = point prevalence, AHRQ = Agency for Healthcare Research and Quality, ONS = Oncology Nursing Society. Of the 21 studies, there are 19 primary studies; one study is a long-term follow-up and two are secondary analyses of the primary study.

^aRelated studies.

TABLE 10.2

Oncology Nursing Society Levels of Evidence Used to Grade the Quality of Smoking Cessation Intervention Studies

ONS Levels of Evidence	Evidence Source
1	Qualitative systematic review (also called integrative review) or quantitative systematic review (also called meta-analysis) or multiple, well-designed, randomized, controlled trials of adequate quality
2	At least one properly designed, randomized, controlled trial of appropriate size (record if multisite and over 100 subjects, but not required)
3	Well-designed trial without randomization (e.g., single group pre/post, cohort, time series, meta-analysis of cohort studies)
4	Well-conducted, qualitative, systematic review of nonexperimental design studies
5	Well-conducted case-control study
6	Poorly controlled study (e.g., randomized controlled trial with major flaws) or uncontrolled studies (e.g., correlational descriptive study, case series)
7	Conflicting evidence with the weight of evidence supporting the recommendation of meta-analysis showing a trend that did not reach statistical significance National Institutes of Health Consensus Reports Published practice guidelines, for example, from professional organizations (e.g., Oncology Nursing Society, American Society of Clinical Oncology), health care organizations (e.g., American Cancer Society), or federal agencies (e.g., National Cancer Institute, Centers for Disease Control)
8	Qualitative designs Case studies; opinions from expert authorities, agencies, or committees

Note. From "Rating the Quality of Evidence for Clinical Practice Guidelines," by D. C. Hadorn, D. Baker, J. S. Hodges, and N. Hicks, 1996, *Journal of Clinical Epidemiology*, 49, 749–753. Copyright 1996 by Excerpta Medical Inc. Adapted with permission from Oncology Nursing Society Publishing.

^aLevels of evidence range from the strongest evidence at the top to the weakest level of evidence at the bottom.