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CLINICAL SCHOLARSHIP

Long-term effectiveness of a nurse-led smoking cessation clinic at a comprehensive cancer center

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Abstract

Purpose: Smoking cessation interventions should be promoted in cancer centers to improve clinical outcomes among cancer patients and the quality of life of cancer-free patients and survivors. The aim of the present study was to examine long-term abstinence (1, 3, and 5 years) among smokers who received an intensive nurse-led smoking cessation intervention.

Design: A prospective follow-up study was conducted in a smoking cessation clinic in Barcelona.

Methods: The study included 479 smokers who received a nurse-led smoking cessation intervention that included motivational interviewing, psychological support, behavioral change counseling, promotion of smoke-free policies, and relapse-prevention strategies, as well as pharmacotherapy if necessary, for 12 months. We calculated overall and sex-specific 1-, 3-, and 5-year abstinence probabilities (Kaplan–Meier curves) and adjusted hazard ratios (aHRs) of relapse with 95% confidence intervals (CIs) using Cox regression.

Findings: The overall probability of abstinence at 1 and 5 years was 0.561 (95% CI: 0.516–0.606) and 0.364 (95% CI: 0.311–0.417), respectively. Females had a higher, but not significant, hazard ratio for relapse compared to males (aHR = 1.180; 95% CI: 0.905–1.538). Attending <5 visits was the most remarkable determinant of relapsing compared to attending 5–9 visits or ≥10 visits, both overall and by sex (p for trend: overall, $p < 0.001$; males, $p = 0.007$; and females, $p < 0.001$).

Conclusions: Abstinence probability decreased over the 5-year follow-up but was relatively high. Males had higher abstinence rates than females in all follow-up periods. Completeness of the intensive intervention was the main predictor of cessation.

Clinical Relevance: Smoking cessation interventions should consider sex and incorporate strategies to increase adherence to obtain higher long-term abstinence rates.

KEYWORDS
smoking cessation, cancer, abstinence, relapse, nursing

INTRODUCTION

Tobacco use is a significant public health hazard responsible for nearly 8 million deaths worldwide (WHO, 2019), including 20% of all cancer deaths (American Cancer Association, 2018). As a major risk factor for several types of cancers, smoking is responsible for 35% of all cancers overall and 80% of head–neck and lung cancers (American Cancer Association, 2018). Between 18% and 27% of cancer patients continue to smoke after their diagnosis (Baron-Epel et al., 2004; Ehrenzeller et al., 2018; Yang et al., 2015), and only 40%–60% of them report having been advised to quit by their health care providers (Ehrenzeller et al., 2018; Ramaswamy et al., 2016). Persistent smoking in cancer patients reduces the effectiveness of chemo and/or radiotherapy (Smith et al., 2019), increases perioperative risks (Sorensen, 2012), exacerbates the risk of recurrence and secondary cancers (Moreira et al., 2014), and reduces survival time (Gemine et al., 2019). In addition, continued smoking can worsen the late and long-term sequelae of cancer treatment, which commonly includes hypertension and cardiovascular disease (Leach et al., 2015), and is the first cause of mortality among cancer survivors (Armenian et al., 2016). Cancer patients who continue to smoke after diagnosis also present with higher rates of nicotine dependence, low self-efficacy, higher levels of depression and/or anxiety, and stigma (Cataldo et al., 2010; Gritz et al., 2014; Guimond et al., 2017).

Current research shows that smoking cessation services are less successful among cancer survivors and recommend that specialized programs introduce cancer-specific (Abrams, 2016; Ehrenzeller et al., 2018; Gritz et al., 2014) and gender-specific (Ehrenzeller et al., 2018) approaches to overcome the particular barriers among these patients, as female cancer survivors have a higher smoking prevalence (22% to 48%) than male survivors (13%–34%) (Ehrenzeller et al., 2018). The US National Cancer Institute recommends combining evidence-based motivational strategies and cognitive behavioral therapy (Hofmann et al., 2012), pharmacotherapy, and close follow-up with repeated treatment as needed (Shields et al., 2016). Thus, as recommended by several medical and nursing oncology scientific associations (Bialous & Sarna, 2016; Hanna, 2013; Morgan et al., 2011), comprehensive cancer centers should provide tobacco cessation services to all of their patients, both those with a confirmed cancer diagnosis and those without, such as people in cancer genetics studies or who are screened for cancer (Adami et al., 2001; Cinciripini, 2017). In the US, more than 80% of oncology hospitals provide tobacco cessation programs (Gallaway et al., 2019) with different levels of approach and intensity (D'Angelo et al., 2019), and some European health organizations have built integrated programs (Davidson et al., 2018), but few of them have evaluated their effectiveness.

Since 2006, the Catalan Institute of Oncology, a Comprehensive Cancer Center in Barcelona (Spain), has had a specialized nurse-led clinic targeting cancer patients, non-cancer patients, and healthcare workers. Smoking consumption is slightly higher in Spain than in the rest of Europe (24% vs. 23% in EU) (European Union, 2020); therefore, offering effective programs to support smokers is a priority. Though the effectiveness of smoking cessation programs is commonly assessed at mid-term (between 6 and 18 months after quitting) (Fiore & Baker, 2011), long-term effectiveness is rarely investigated. Therefore, we examined long-term smoking cessation abstinence (1, 3, and, 5 years) among smokers attending our smoking cessation clinic, with a focus on gender differences.

PARTICIPANTS AND METHODS

Design

This was a prospective follow-up study conducted in a smoking cessation clinic at the Catalan Institute of Oncology located in L'Hospitalet del Llobregat (Barcelona, Spain). The study was of an observational nature because all subjects were exposed to the same protocol in place in the clinic. Participants were interviewed years after attending the clinic (exposure variable) to measure their sustained abstinence in days (outcome). The methods and results are reported following the STROBE checklist. This study obtained ethics approval from the Hospital of Bellvitge and followed the Declaration of Helsinki on human research ethics.

Setting and recruitment of participants

The smoking cessation clinic attends to smokers referred by in-out departments of the hospital and self-referred smokers from the breast and colorectal cancer screening programs who ask for assistance, frequently after reading the educational leaflets distributed around the hospital. The clinic also attends to patients' relatives, people screened for cancer on our premises, and hospital workers seeking help to quit smoking. Therefore, some of the patients enrolled in the smoking cessation clinic have cancer, whereas others are cancer-free. The clinic provides expert counseling and follow-up support free of charge; medication, if needed, is financed by each patient according to their level of health coverage by the National Health System.

The individuals recruited for this study included all smokers who attended the clinic between January 2010 and December 2015 and decided to start the quitting process on a second visit. A total of 656 smokers approached the cessation clinic and 479 started treatments for smoking cessation; 177 patients did not enter the study because they attended the clinic only once and did not start the quitting process.

Approach and components of the nurse-led smoking cessation program

The smoking cessation clinic is a nurse-led specialized service that offers support to quit across the cancer care continuum (Dulaney et al., 2017). The clinic treats nearly 150–200 new smokers a year and conducts more than 1600 overall visits annually. The smoking cessation clinic is based on current evidence-based guidelines (Fiore & Baker, 2011), and its approach can be defined as an individual intensive smoking cessation approach that includes motivational interviewing, psychological support, individual health behavior change counseling, promotion of smoke-free policies, and relapse-prevention strategies, as well as pharmacotherapy if necessary. The program at the clinic includes one to two sessions before the quitting day ("D Day" or designed target day to quit) and nine sessions after over the course of 12 months. The follow-up visits are planned as follows: within the first week, around day 15, and at months 1, 2, 3, 6, 9, and 12 of quitting. The first sessions (before D Day) usually last 60 min and the follow-up sessions are about 30 min. Each session has a different aim, but the first session explores the smoking status of the smoker and their willingness to quit according to the transtheoretical model of change (Prochaska et al., 1992). The second session prepares the person for the first days without smoking and aims to choose the therapeutic plan according to their nicotine dependence as measured using the Fagerström scale (Heatherton et al., 1991). The third session, after D Day, aims to help the participant with issues concerning the immediate quitting process, including withdrawal symptoms, adherence to the treatment, the presence of side effects, and the review of immediate lapse and relapse risk situations. The fourth session includes maintaining motivation, promoting physical activity, handling stress, and mood swing strategies. The fifth session onwards is focused on preparing long-term abstinence by maintaining motivation, identifying possible forthcoming risk situations, and strategies to overcoming them.

Follow-up of patients

To analyze long-term abstinence and relapse, we designed a telephone-administered follow-up questionnaire that included information on current smoking status and, in the case of relapse, the date (month and year) when the patient began to smoke again. The phone calls were conducted by eight trained interviewers between January and February 2017. Before the calls, the vital status of participants was updated using the Central Register of the Catalan Health Service. Of the 479 participants in follow-up, 63 died (mostly cancer patients). Thus, 416 participants were called a maximum seven times (at different times and days); 18 were not located and nine declined to respond to the call. Information about tobacco use and the status of consumption in 90 patients (27 who did not participate in the follow-up study and 63 who died before contacting them) was retrieved from clinical records. Each follow-up call lasted from 3 to 10 min, and all participants gave oral informed consent.

Main outcomes and independent variables

The main outcome variable was number of days of sustained abstinence. Participants were considered to have relapsed if they smoked one or more cigarettes per day after D Day (Hughes et al., 2003). The time to relapse was calculated as the number of days from D Day to the day of relapse (assuming each month had an average of 30 days, 5 years × 12 months × 30 days = 1800 days of follow-up). Patients who relapsed immediately after D Day were assigned a 1-day time to relapse. Patients who relapsed were offered a multiple choice question to self-report their main reasons for relapsing based on the most frequent causes of relapse: anxiety, depression, weight gain, and boredom (Fiore & Baker, 2011).

The main independent variables were sex (male, female), age (≤40, 41–50, ≥51 years old), education level attained (primary and less, secondary or university studies), and having a cancer diagnosis (yes/no) confirmed by the medical record. Smoking pattern before quitting was obtained from the clinical records: the number of cigarettes per day (CPD; ≤10, 11–20, >20), age when started smoking (<16, ≥16 years old), nicotine dependence assessed with the Fagerström test (scored 0–10, grouped as low, 0–4; medium, 5–6; high, 7–10) (Fagerstrom, 1978), number of prior quit attempts (none, 1–2, and, >2), pharmacological treatment (none, NRT, bupropion or varenicline, alone or in combination with NRT), and number of visits (2–5, 6–9, ≥10).

Statistical analysis

We used the Kaplan–Meier method to estimate the probability of continued abstinence and 95% confidence intervals (CIs) at 1, 3, and 5 years of follow-up. We used multivariate Cox regression models to estimate the hazard ratios (HRs) and 95% CIs of relapse at the end of follow-up after checking the proportionality of the hazards with time of follow-up. Cox regression models used age as a continuous variable for adjustment. Our analysis showed a difference in abstinence probability by sex, as already reported in other studies from Spain (Fernandez et al., 2006); therefore, all analyses were performed separately for males and females.

RESULTS

Table 1 provides the participants' sociodemographic characteristics overall and by sex. The median participant age was 46 years (interquartile range [IQR]: 37–57) in males and 45 years (IQR: 39–52) in females ($p = 0.047$). Most participants had finished secondary or university studies and 42.8% were cancer patients, with no differences by sex. The median number of CPD was 20 for both males and females ($p = 0.165$). Most participants (48.4%) used NRT alone for smoking cessation, 26.3% did not use any pharmacological aid, and 25.3% used bupropion or varenicline alone or in combination with NRT (11 used bupropion alone and 15 used varenicline alone).

TABLE 1 Prevalence of abstinence at end of follow-up according to sex, sociodemographic and other treatment-related characteristics.

		Overall ($n = 479$)		Male ($n = 224$)		Female ($n = 255$)	
	N (%)	*N* (%)	*p*-value[a]	*N* (%)	*p*-value[a]	*N* (%)	*p*-value[a]
Total		211 (44.1)		113 (50.4)		98 (38.4)	
Age (years)							
≤40	151 (31.5)	69 (32.7)	0.086	36 (31.9)	0.124	33 (33.7)	0.631
41–50	161 (33.6)	60 (28.4)		24 (21.2)		36 (36.7)	
≥51	167 (34.9)	82 (38.9)		53 (46.9)		29 (29.6)	
Educational level							
Primary or less	88 (21.3)	33 (21.3)	0.561	21 (26.9)	0.689	12 (15.6)	0.586
Secondary	188 (45.4)	75 (48.4)		40 (51.3)		35 (45.5)	
University	138 (33.3)	47 (30.3)		17 (21.8)		30 (38.9)	
Cancer diagnostic							
Yes	205 (42.8)	102 (48.3)	0.030	61 (54.0)	0.181	41 (41.8)	0.193
No	274 (57.2)	109 (51.7)		52 (46.0)		57 (58.2)	
No. of cigarettes smoked per day							
≤10	79 (16.5)	38 (18.0)	0.490	19 (16.8)	0.275	19 (19.4)	0.664
11–20	216 (45.1)	89 (42.2)		41 (36.3)		48 (49.0)	
>20	184 (38.4)	84 (39.8)		53 (46.9)		31 (31.6)	
Age at starting smoking (years)							
<16	223 (46.6)	101 (47.9)	0.610	67 (59.3)	0.002	34 (34.7)	0.015
≥16	256 (43.4)	110 (52.1)		46 (40.7)		64 (65.3)	
Cigarette dependence score[b]							
Low (0–4)	173 (36.1)	78 (37.0)	0.936	36 (31.9)	0.709	42 (42.9)	0.692
Medium (5–6)	153 (31.9)	66 (31.3)		37 (32.7)		29 (29.5)	
High (7–10)	153 (31.9)	67 (31.7)		40 (35.4)		27 (27.6)	
No. of quit attempts							
None	87 (18.2)	37 (17.5)	0.921	21 (18.6)	0.688	16 (16.3)	0.979
1 or 2	255 (53.2)	112 (53.1)		61 (54.0)		51 (52.0)	
3 or more	137 (28.6)	62 (29.4)		31 (27.4)		31 (31.7)	
Pharmacological treatment							
None	125 (26.3)	58 (27.5)	0.015	34 (30.1)	0.104	24 (24.5)	0.243
NRT	230 (48.4)	112 (53.1)		64 (56.6)		48 (49.0)	
Bupropion or Varenicline (alone or with NRT)[c]	120 (25.3)	41 (19.4)		15 (13.3)		26 (26.5)	
No. of visits							
2–5	163 (34.0)	63 (29.9)	0.190	40 (35.4)	0.441	23 (23.5)	0.023
6–9	149 (31.1)	67 (31.7)		33 (29.2)		34 (34.7)	
≥10	167 (34.9)	81 (38.4)		40 (35.4)		41 (41.8)	

Abbreviation: NRT, nicotine replacement treatment.

[a]Chi-squared test.

[b]Nicotine dependence scored measured with the Fageström test.

[c]Bupropion or Varenicline: alone (Bupropion: 11; Varenicline: 15) or in combination with NRT (either Bupropion and/or Varenicline with NRT).

Abstinence probability at 1 year was 0.561 (95% CI: 0.516–0.606), but it decreased significantly at 3 years to 0.427 (95% CI: 0.378–0.476) and 5 years to 0.364 (95% CI: 0.311–0.417; Table 2). For the entire follow-up period, the abstinence probability was always higher in males ($p = 0.048$; Figure 1). We also observed an overall trend in which the higher the education level, the higher the probability of relapsing (p for trend ≤0.001). No differences in abstinence rates were found between participants with cancer and participants without cancer. Smokers who had more visits had a lower probability of relapsing during all of the follow-up periods ($p < 0.001$; Table 2).

TABLE 2 Probability of abstinence and hazard ratios of relapse at 1-, 3- and 5-year follow-up among all participants.

	Probability of smoking abstinence							
	1-Year follow-up		3-Year follow-up		5-Year follow-up		Hazard ratios of relapse[a]	
	p	95% CI	*p*	95% CI	*p*	95% CI	HR	95% CI
Total	0.561	0.516–0.606	0.427	0.378–0.476	0.364	0.311–0.417		
Sex								
Male	0.616	0.549–0.683	0.463	0.389–0.538	0.400	0.316–0.484	1	–
Female	0.514	0.451–0.577	0.394	0.329–0.458	0.326	0.259–0.393	1.180	0.905–1.538
Age[b] (years)								
≤40	0.601	0.523–0.679	0.474	0.390–0.558	0.418	0.330–0.506	1.007	0.993–1.020
41–50	0.513	0.433–0.593	0.368	0.286–0.451	0.295	0.211–0.379		
≥51	0.566	0.486–0.646	0.432	0.345–0.519	0.342	0.213–0.471		
Educational level								
Primary or less	0.511	0.407–0.615	0.385	0.277–0.492	0.307[e]	0.189–0.425	1	-
Secondary	0.548	0.477–0.619	0.438	0.366–0.511	0.389	0.313–0.465	0.981	0.684–1.409
University	0.529	0.447–0.611	0.373	0.289–0.457	0.309	0.223–0.395	1.130	0.761–1.679
p value for trend							<0.001	
Cancer diagnostic								
Yes	0.557	0.484–0.630	0.440	0.361–0.519	0.328	0.163–0.493	0.899	0.669–1.209
No	0.550	0.491–0.609	0.417	0.355–0.480	0.359	0.194–0.524	1	–
No. of cigarettes smoked per day								
≤10	0.641	0.531–0.751	0.481[f]	0.289–0.673	0.481[f]	0.289–0.673	1	–
11–20	0.526	0.457–0.595	0.412	0.342–0.483	0.347	0.271–0.422	1.010	0.663–1.538
>20	0.564	0.490–0.638	0.445	0.367–0.524	0.380	0.293–0.466	0.885	0.524–1.495
p value for trend							0.416	
Age of initiation (years)								
<16	0.562	0.495–0.629	0.451	0.378–0.523	0.364	0.284–0.444	1	–
≥16	0.556	0.493–0.619	0.405	0.339–0.471	0.354	0.283–0.425	1.056	0.811–1.374
Cigarette dependence score[c]								
Low (0–4)	0.585	0.511–0.659	0.431	0.349–0.513	0.371	0.283–0.460	1	–
Medium (5–6)	0.573	0.493–0.653	0.444	0.360–0.529	0.356	0.263–0.449	1.075	0.748–1.546
High (7–10)	0.521	0.439–0.603	0.399	0.313–0.485	0.321	0.203–0.439	1.345	0.883–2.049
p value for trend							0.157	
No. of quit attempts								
None	0.527	0.417–0.637	0.397	0.283–0.511	0.330	0.195–0.465	1	–
1 or 2	0.537	0.472–0.602	0.402	0.336–0.469	0.346	0.273–0.419	0.941	0.668–1.325
3 or more	0.617	0.535–0.699	0.479	0.391–0.568	0.385	0.286–0.485	0.769	0.520–1.137
p value for trend							0.150	
Pharmacological treatment								
None	0.533	0.443–0.623	0.345	0.268–0.421	0.178	0.139–0.218	1	–
NRT	0.613	0.548–0.678	0.473	0.402–0.543	0.417	0.343–0.491	1.039	0.753–1.434
Bupropion or Varenicline (alone or with NRT)[d]	0.488	0.398–0.578	0.360	0.270–0.450	0.267	0.177–0.357	1.434	0.992–2.072
p value for trend							0.052	
No. of visits								
2–5	0.413	0.333–0.493	0.349	0.265–0.432	0.261	0.163–0.360	2.216	1.612–3.047

(Continues)

TABLE 2 (Continued)

	Probability of smoking abstinence							
	1-Year follow-up		3-Year follow-up		5-Year follow-up		Hazard ratios of relapse[a]	
	p	95% CI	*p*	95% CI	*p*	95% CI	HR	95% CI
6–9	0.600	0.520–0.680	0.451	0.363–0.539	0.356	0.258–0.455	1.250	0.906–1.724
≥10	0.657	0.584–0.730	0.474	0.394–0.555	0.435	0.349–0.521	1	—
p value for trend							<0.001	

Abbreviation: NRT, Nicotine replacement treatment.

[a]Adjusted Hazard Ratio for sex, age, educational level, cancer diagnostic, number of cigarettes, age of initiation, nicotine dependence, number of quit attempts, pharmacological treatment and number of visits.

[b]Age was considered continuous in the Cox Regression.

[c]Cigarette dependence test assessed with the Fagerström test.

[d]Bupropion or Varenicline: alone (Bupropion: 11; Varenicline: 15) or in combination with NRT (either Bupropion and/or Varenicline with NRT).

[e]Kaplan-Maier estimate at 4 years 4 months.

[f]Kaplan-Maier estimate at 2 years 8 months.

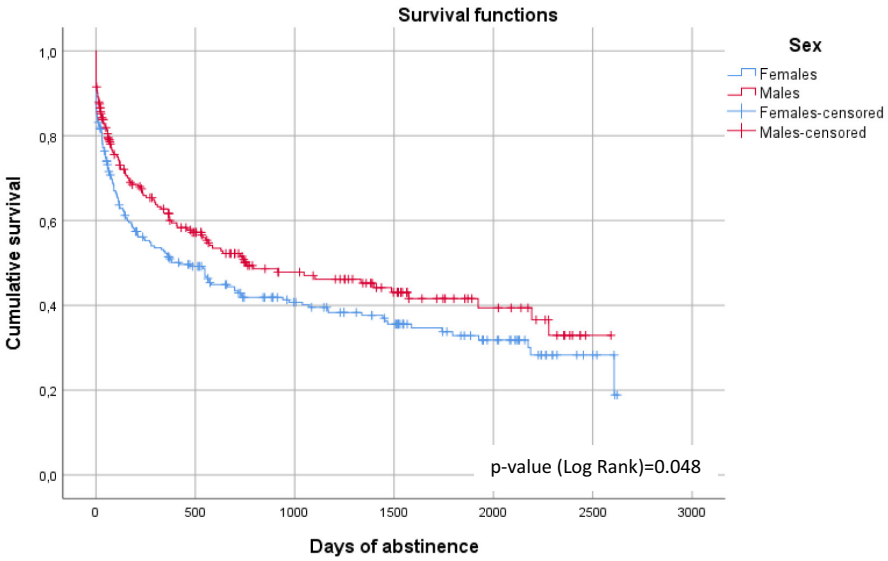

FIGURE 1 Kaplan–Meier curves of abstinence by sex.

The risk of relapsing in males (Table 3) was higher among those who had received bupropion or varenicline in combination with NRT or alone (adjusted HR = 2.189, 95% CI: 1.175–4.077) compared to those who had not received any pharmacological treatment or NRT. In addition, males who had 2–5 visits had a greater risk of relapsing than those who had ≥10 visits (adjusted HR = 2.156, 95% CI: 1.215–3.827; *p* for trend ≤0.001). The risk of relapsing in females was higher among those who had 2–5 visits (adjusted HR = 2.397, 95% CI: 1.625–3.534) compared to those who had 6–9 visits or ≥ 10 visits (*p* for trend ≤0.001; Table S1).

The most often reported causes of relapse were anxiety, sadness, and "other reasons" (including family problems and cravings). Sadness was more frequent among females than among males ($p = 0.036$) and non-cancer smokers relapsed more due to "other reasons" than cancer patients ($p = 0.029$; Table S2).

DISCUSSION

The probability of abstinence among patients treated in a specialized nurse-led tobacco cessation clinic at a comprehensive cancer center was higher among males than females during the entire follow-up period, with the number of visits being the most relevant determinant for understanding abstinence rates in both sexes. Smokers with a confirmed cancer diagnosis had a similar abstinence probability as non-cancer smokers. These associations were independent of other well-known predictors of relapse, such as nicotine dependence, though we observed a higher risk of relapse among males when they received combined pharmacological therapy. Furthermore, we found that a higher education level was inversely associated with the risk of relapsing, which was previously shown to be a determinant of risk of relapse (Kashigar et al., 2013), but we did not find the same pattern.

A constant in the clinical evaluation of several smoking cessation programs is that females achieve lower abstinence rates than males after a quit attempt (Bottorff et al., 2014; Rasmussen et al., 2017; Torchalla et al., 2011). This is true for counseling and different pharmacological treatments, from no pharmacotherapy at all to the combination of several pharmacotherapies (Torchalla et al., 2011). Females have been reported to have up to six times the risk of relapsing during smoking cessation treatment than males (Kim et al., 2015). Some hypotheses that may explain these gender differences are that females receive less effective social support than males during a quit attempt, that females usually present with lower levels of motivation and confidence related to quitting, and that they have more mental comorbidities, such as depression and anxiety (Minian et al., 2016). A recent study in the Netherlands that explored gender-specific barriers to smoking cessation showed that psychological factors, such as distress, are the main reasons for relapsing among females, compared to environmental factors for males (Dieleman et al., 2021). In our study, anxiety was the most frequently reported cause of relapse, but there were no differences by sex or the presence of a cancer diagnosis. Nevertheless, sadness was the second most frequent cause of relapse, and it was significantly higher among females than males.

Smokers with cancer (Gritz et al., 2014) and female smokers (Dieleman et al., 2021) have been identified as having a high incidence of depression, anxiety, and stress. These findings suggest that healthcare providers need specific training to identify emotional disorders and, if necessary, to refer smokers to behavioral therapists who have expertise in treating both addictive and mental health disorders (Chang et al., 2017). In addition, after 1 year of follow-up, we observed a reduction in abstinence probability among smokers, especially among women, suggesting the importance of recontacting smokers who have succeeded in quitting, at least every year, to send them a positive message that can help them to maintain their abstinence. Taken together, the results suggest that smoking cessation programs should have a gender-specific approach to cope with frequent causes of relapse, such as depression, anxiety, and stress (Bottorff et al., 2014; Dieleman et al., 2021).

Remarkably, we did not observe differences in abstinence rates among patients with and without a cancer diagnosis. Nayan et al. (2013) conducted a review in which behavioral therapy and pharmacotherapy were evaluated, showing that abstinence rates in cancer patients did not differ from usual care (ranging from 3% to 30%) (Nayan et al., 2013). Both cancer and non-cancer smokers had an overall abstinence rate >55% at the 1-year follow-up in the present study, which is similar to cancer patients at MD Anderson Cancer Center (abstinence rate 47% at 9-month follow-up) (Karam-Hage et al., 2014). A strength of the current study is determining follow-up abstinence rates of up to 5 years for patients who normally attended the clinic, as the majority of smoking cessation programs only evaluate up to 6 or 12 months of follow-up (Fiore & Baker, 2011).

We did not find any differences between participants with and without a cancer diagnosis. The gold standard for tobacco cessation treatment remains the same for patients with cancer as for other smokers from the general population, that is, combining pharmacological and behavioral therapy (Gritz et al., 2014), though the US National Comprehensive Cancer Network (NCCN) points out that high-intensity behavioral therapy with multiple counseling sessions is most effective in cancer patients (Shields et al., 2016). However, the NCCN does not recommend a minimum number of sessions to be included in cessation programs addressed to cancer patients. Remarkably, in our study, we observed a positive trend between the number of sessions and abstinence rates. Thus, in line with our results, we recommend that nurses and other health care professionals who run smoking cessation clinics introduce brief (15–20 min) but periodic sessions in which they can provide psycho-emotional support and help their patients prevent relapses. The providers could also interweave different approaches (e.g., phone calls, text messages, video calls, interactive voice response technology) to assure treatment continuance and increased adherence. A few studies have highlighted the importance of encouraging follow-up visits for smokers because they lead to higher cessation rates (Huang et al., 2018) and propose repeated assistance to increase long-term smoking cessation (Bailey et al., 2018).

LIMITATIONS

Some limitations of this study should be noted. First, we assessed the main outcome (long-term abstinence) in most participants by conducting a telephone interview; thus, no biochemical validation was possible. Nonetheless, we are confident that our data were not affected by a social desirability bias because patients were interviewed by neutral persons who were not involved in the program. However, it is possible that participants that relapsed could have had, to some degree, a backward telescoping bias (Regan et al., 2016) by not recalling well the exact time when they relapsed. In all cases, interviewers asked them for the day, month, and year of their relapse, and if the participants were not able to recall clearly, interviewers were trained to help the participants find an approximate date linked to the time of relapse, such as a significant personal event (e.g., celebration date, change of job). This methodology helped them to set a "day of relapsing". When the exact day was difficult to identify but the month and year were provided, we selected day 15 of the month as a proxy. Second, we assessed the education level from both the clinical records and at the time of the interview because this information was not always included in our clinical records. Although patients could have overestimated their education level, we applied the same questions that we have used in previous studies (Martínez et al., 2020). Third, the cohort of participants who tried to quit at the smoking cessation unit is unlikely representative of smokers in the general population, as our hospital is a comprehensive cancer center. Fourth, we could have had nonresponse bias, but the response rate was very high (95% of eligible patients) and patients who did not participate were mainly excluded due to problems with their telephone number. Participants who died before the telephone call to assess long-term follow-up (13.2%) contributed a median of 15 months to

TABLE 3 Probability of abstinence and adjusted hazard ratios of relapse at 1-, 3- and 5-year follow-up among males.

	Probability of smoking abstinence							
	1-year follow-up		3-year follow-up		5-year follow-up		Hazard ratios of relapse[a]	
	p	95% CI	*p*	95% CI	*p*	95% CI	aHR	95% CI
Total	0.616	0.549–0.683	0.463	0.389–0.538	0.400	0.316–0.484		
Age (years)								
≤40	0.606	0.492–0.720	0.475	0.353–0.597	0.422	0.273–0.571	1.006[b]	0.988–1.024
41–50	0.592	0.463–0.721	0.399	0.262–0.536	0.318	0.166–0.469		
≥51	0.632	0.524–0.740	0.484	0.355–0.613	0.404[e]	0.245–0.563		
Educational level								
Primary or less	0.565	0.422–0.708	0.450	0.295–0.604	0.371[e]	0.185–0.557	1	—
Secondary	0.585	0.485–0.685	0.469	0.364–0.573	0.392	0.273–0.510	1.218	0.695–2.136
University	0.543	0.400–0.686	0.348[f]	0.205–0.491	0.348[f]	0.205–0.491	1.445	0.773–2.703
p value for trend							<0.001	
Cancer diagnostic								
Yes	0.610	0.510–0.710	0.472	0.359–0.584	0.386[h]	0.257–0.515	1.212	0.756–1.946
No	0.611	0.519–0.703	0.452	0.352–0.551	0.411	0.304–0.519	1	—
No. of cigarettes smoked per day								
≤10	0.660	0.494–0.826	0.442[f]	0.250–0.634	0.442[f]	0.250–0.634	1	-
11–20	0.509	0.401–0.617	0.390	0.276–0.504	0.299	0.158–0.440	1.214	0.618–2.384
>20	0.654	0.554–0.754	0.533	0.421–0.645	0.455	0.322–0.588	0.754	0.322–1.766
p value for trend							0.327	
Age of initiation (years)								
<16	0.677	0.585–0.769	0.564	0.456–0.673	0.469	0.325–0.613	1	—
≥16	0.554	0.460–0.648	0.374	0.276–0.472	0.317	0.207–0.426	1.407	0.890–2.223
Cigarette dependence score[c]								
Low (0–4)	0.600	0.480–0.720	0.454	0.320–0.587	0.423[g]	0.288–0.558	1	—
Medium (5–6)	0.608	0.496–0.720	0.445	0.322–0.569	0.366	0.228–0.503	1.124	0.638–1.982
High (7–10)	0.641	0.528–0.754	0.479	0.348–0.610	0.367	0.165–0.569	1.319	0.668–2.605
p value for trend							0.420	
No. of quit attempts								
None	0.560	0.407–0.713	0.425	0.259–0.591	0.349	0.153–0.545	1	—
1 or 2	0.616	0.526–0.706	0.421	0.319–0.523	0.358[e]	0.246–0.470	0.984	0.588–1.649
3 or more	0.644	0.515–0.773	0.547	0.399–0.694	0.480	0.302–0.659	0.727	0.390–1.355
p value for trend							0.286	
Pharmacological treatment								
None	0.645	0.522–0.768	0.496[i]	0.359–0.633	0.496[i]	0.359–0.633	1	—
NRT	0.641	0.549–0.733	0.495	0.393–0.597	0.415	0.301–0.529	1.282	0.776–2.116
Bupropion or Varenicline (alone or with NRT)[d]	0.443	0.284–0.602	0.325	0.165–0.485	0.265	0.098–0.432	2.189	1.175–4.077
p value for trend							0.016	
No. of visits								
2–5	0.519	0.397–0.641	0.429	0.293–0.565	0.398[g]	0.253–0.543	2.156	1.215–3.827
6–9	0.566	0.448–0.684	0.430	0.306–0.555	0.351	0.211–0.491	1.508	0.914–2.486
≥10	0.714	0.608–0.820	0.508	0.379–0.637	0.435	0.281–0.589	1	—
p value for trend							0.007	

Abbreviation: NRT, nicotine replacement treatment.

[a]Adjusted Hazard Ratio for sex, age, educational level, cancer diagnostic, number of cigarettes, age of initiation, nicotine dependence, number of quit attempts, pharmacological treatment and number of visits.

[b]Age was considered continuous in the Cox Regression.

[c]Cigarette dependence test assessed with the Fagerström test.

[d]Bupropion or Varenicline: alone (Bupropion: 11; Varenicline: 15) or in combination with NRT (either Bupropion and/or Varenicline with NRT).

[e]Kaplan-Maier estimate at 4 years 4 months.

[f]Kaplan-Maier estimate at 2 years.

[g]Kaplan-Maier estimate at 4 years 1 month.

[h]Kaplan-Maier estimate at 3 years 8 months.

[i]Kaplan-Maier estimated at 2 years 1 month.

follow-up and, therefore, we assumed that they were abstinent during that time, which may be another source of bias. Finally, this study is based on real-life experience, and we did not evaluate the efficacy of a new intervention because the program cannot be considered an innovation. In contrast, our study was of an observational nature because all subjects were exposed to the same protocol in place in the clinic. The efficacy of behavioral and pharmacological therapy has been demonstrated, but more studies on the effectiveness of smoking cessation programs in real-care settings are still necessary.

CONCLUSIONS

The overall abstinence probability was high during a long-term follow-up. No differences in abstinence rates were found among cancer and non-cancer smokers, but males achieved higher abstinence rates than females in all of the follow-up periods. The number of visits was the most significant determinant for understanding abstinence rates in both sexes—the higher the number of visits, the higher the abstinence rate. Anxiety and sadness were the most frequent reasons for relapsing, with sadness being most frequent among females. Therefore, intense smoking cessation programs should introduce engaging strategies to improve adherence and promote several types of visits, online or in-person, to sustain the planned visits with counselors knowledgeable in how to handle the gender-specific negative emotions associated with relapse.

RELEVANCE TO CLINICAL PRACTICE

We did not observe a difference in abstinence probabilities among cancer and non-cancer smokers. According to our findings, intense smoking cessation programs should introduce engaging strategies to improve adherence and promote several types of visits, online or in-person, to sustain the planned visits with counselors knowledgeable in how to handle the gender-specific negative emotions associated with relapse.

WHAT THIS PAPER ADDS

- A follow-up study that included 479 smokers who attended a nurse-led smoking cessation clinic obtained an overall high abstinence probability at 1 year (0.561; 95% CI: 0.516–0.606) and 5 years of follow-up (0.364; 95% CI: 0.311–0.417).
- No differences in abstinence probabilities were found among cancer and non-cancer smokers.
- Males had higher abstinence rates than females.
- The number of visits was the most significant predictor of abstinence in both sexes.
- Completeness of the intensive program (≥10 follow-up visits) was the main predictor of cessation, and implementation research to improve adherence is warranted.

CLINICAL RESOURCES

- Information provided by CDC addressed to health care professionals, particularly those in oncology care, regarding how to treat patients' tobacco use and dependence: https://www.cdc.gov/tobacco/patient-care/care-settings/cancer/index.htm
- Information provided by NIH about treating smoking in cancer patients, an essential component of cancer care: https://cancercontrol.cancer.gov/brp/tcrb/monographs/monograph-23
- Nurses Against Tobacco website: https://www.tobaccofreenurses.org/
- Publication Dr. Sarna. Enhancing the Nurse's Role in Tobacco Prevention and Cessation: New Challenges. https://www.jto.org/article/S1556-0864(18)31018-9/fulltext#relatedArticles

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CONFLICT OF INTEREST STATEMENT

None.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Table S1.

Table S2.

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