Continued smoking after a cancer diagnosis: A longitudinal study of intentions and attempts to quit

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DECLARATION OF INTERESTS

None declared.

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ABSTRACT

Purpose

Continued smoking after a cancer diagnosis is associated with poor treatment outcomes and reduced life expectancy. We aimed to identify the stability of smoking status after diagnosis including quit attempts and quit intentions.

Methods

Participants with a first primary cancer diagnosis were recruited via two state-based registries in Australia. Questionnaires were mailed at approximately 6 months (T1), 1 year (T2), 2 years (T3) and 3.5 years (T4) post-diagnosis. Smoking status and quitting intentions were assessed at each time point.

Results

A cohort of 1444 people was recruited. People who indicated that they were more than 9 months post-diagnosis are excluded from analysis, leaving 1407 eligible study participants. Sixty-six (37%) of the 178 self-reported smokers at diagnosis had quit in the 6 months post-diagnosis (T1), the remaining 112 (63%) reported being a current smoker. Of the smokers at T1, 40% intended to quit: with 8% having quit smoking by T2; 11% quit by T3; 12% quit by T4. Of those who reported at T1 that they intended to quit in the next 6 months, 10% or fewer reported having quit at any subsequent time point. Quitting attempts decreased in frequency over time post-diagnosis. Less than 15% of respondents who had quit at or shortly before diagnosis reported relapse to smoking at each time point.

Conclusions

The majority of smokers diagnosed with cancer continue to smoke beyond diagnosis, even in the context of an intention to quit and attempts to do so. Cancer survivors who smoke remain motivated to quit well beyond the initial diagnosis.

Implications for Cancer Survivors

There are clear positive clinical effects of smoking cessation for those who have undergone treatment for cancer, both for short-term treatment outcomes, and for long-term survivorship. Given the substantial rates of continued smoking among those who report smoking at diagnosis and their continued attempts to quit during survivorship, there is a need for improved cessation support

initiatives for people diagnosed with cancer. These initiatives need to continue to be offered to smokers long after the initial diagnosis and treatment.

INTRODUCTION

As cancer survivorship continues to improve, identification and examination of long term lifestyle risk factors associated with survivorship is becoming increasingly important. In Australia, the number of cancers diagnosed almost doubled between 1991 and 2009 [1], yet the five year relative survival from all cancers in Australia increased from 48% in 1984–1988 to 68% in 2009–2013 [2]. Modifiable health behaviours including smoking are becoming increasingly more relevant for post-diagnosis cancer treatment and care [3, 1].

Cigarette smoking by patients with cancer is associated with a number of deleterious treatment-related outcomes, including increased treatment toxicity and complications [2, 4], hospitalisation [5], decreased performance status [6], and morbidity [7, 8]. The 2014 U.S. Surgeon General's report concluded that smoking by cancer patients and survivors *caused* adverse outcomes including increased overall mortality, cancer-specific mortality, risk for second primary cancer, and treatment related toxicity [9]. Cancer survival is shorter for smokers [10, 11]. Continued smoking after a cancer diagnosis doubles the risk of death and halves median survival time [12].

Despite these adverse effects, many patients with cancer continue to smoke after diagnosis, with estimates of continued smoking varying greatly according to cancer type. The highest rates of continued smoking are typically observed among tobacco-related malignancies such as lung or head and neck cancers (e.g., up to 83% of patients with lung cancer continue to smoke [12]), but continued smoking is also prevalent among cancers that are not considered to be directly tobacco related. For example one study of multiple cancer types [13] (including cancers such as bladder, breast, lung, head and neck, and lymphoma) observed the highest rates of smoking to be among survivors of cervical cancer (49%). Additionally, the American Cancer Society's study of cancer survivors noted the highest rates of continued smoking to be among those diagnosed with bladder cancer [14, 15]. In Australia, one study [16] reported a smoking prevalence of 21% for a sample of cancer survivors across a range of cancer types.

Compared to smoking prevalence, patterns of quitting behaviour over time have been less-well described. Rates of quitting vary according to diagnosis type [17]. For example, estimates of rates of quitting among patients with lung or head and neck cancers who were smokers at diagnosis range from 46%-96%, versus 4% among smokers with breast cancer [18]. Although smokers with cancer may be more likely to attempt to quit than those without a cancer diagnosis (for example, Westmaas et al [19]), they often experience relapse, or are unable to quit without extensive support [20, 21]. Relapse rates are reportedly higher for patients with cancer than the general population [22, 23]. Time since diagnosis is associated with abstinence, although results vary on the direction of this association. Some studies report that survivors are likely to experience relapse in the shorter term periods after diagnosis and during/shortly following treatment completion [24, 17, 25], whereas others report that survivors are more likely to relapse and be current smokers at longer term follow up (particularly if they had completed treatment) [26].

Although previous research provides some insight to smoking and/or quitting behaviours, data are often limited and do not provide an insight on how quit behaviours may track and change over time. For example, a number of studies report quitting and relapse in the context of intervention research (see Nayan et al [27]), yet the provision of smoking cessation support as part of routine practice in oncology appears to be low [28, 29]. Thus, although informative for best-practice smoking cessation care, intervention studies perhaps do not represent the 'typical experience' for patients with cancer who are smokers. Non-intervention studies that examine quitting behaviours post-diagnosis are often limited to shorter term follow up periods (often 3 months [30], 6 months [31], or 12 months [32]), meaning that there is a lack of information about the longer term smoking behaviours among cancer survivors. Finally, a number of studies focus only on tobacco-related cancers such as lung or head and neck, to the exclusion of other cancer types [33-35]. A more comprehensive understanding of quitting and smoking among cancer survivors across a variety of malignancies over time may assist in developing smoking cessation support programs (e.g. very long term, relapse-responsive programs) which could benefit oncology patients and improve their long term health outcomes.

Aims

To describe patterns and behaviours of Australian smokers who have cancer up to 3.5 years after diagnosis in terms of:

1. Smoking status after diagnosis
2. Patterns of quit attempts and the role of quit intentions
3. Remaining quit after a diagnosis.

METHODS

The paper is based on the longitudinal Cancer Survival Study (CSS). The CSS is a population-based study that examines the psychosocial and physical health of adult cancer survivors over 3.5 years following diagnosis. Self-reported questionnaires were sent out to participants at four time points; approximately 6 months (T1), 1 year (T2), 2 years (T3) and 3.5 years (T4) post-diagnosis. Data reporting the prevalence and correlates of smoking and smoking cessation at T1 has been reported previously [31], and a detailed methodology for the CSS has been reported elsewhere [36]. The sample reflected the national profile for the top eight incident cancers diagnosed in 2005 in terms of gender and age.

Sample

Participants were recruited via two state based cancer registries in Australia. Eligible participants were:

1) Diagnosed in the previous six months with their first primary cancer (prostate, colorectal, female breast, lung, melanoma, non-Hodgkin's lymphoma, leukaemia, or head and neck)

2) Aged between 18 and 80 years and living in the state of New South Wales (NSW) or Victoria at diagnosis; and

3) Considered by their physician at T1 to be aware of their diagnosis, physically and mentally capable of participating in the study, and sufficiently proficient in English to complete a questionnaire.

Procedure

Cancer registry staff attempted to contact physicians of potentially eligible participants. In NSW, physicians were required to provide active consent for the potentially eligible participant to be

contacted about the study. In Victoria, physicians of potentially eligible participants were required to contact the cancer registry to exclude patients only if they had any concerns about the registry contacting the nominated participant about the study. After physician approval, eligible participants were contacted by registries requesting approval to pass on their contact details to the research team. Individuals who agreed to their contact details being passed to the research team were then mailed a study package by the research team at each time point. The study package included a self-administered scannable pen-and-paper questionnaire and reply-paid envelope. At each study time point a second questionnaire package was sent to non-responders after 3 weeks and a reminder telephone call made after a further 3 weeks. Consent was implied through the return of a completed questionnaire.

Measures

Participants' sex, age, cancer type, and extent of disease at diagnosis were obtained directly from the cancer registries. Socio-demographic characteristics, psychosocial well-being and health behaviours including the smoking-related items were assessed via the questionnaire [37]. Similar questions were asked of participants at each time point as shown in Table 1. Current smokers were defined as those who reported currently smoking cigarettes and tobacco products and who had ever smoked at least 100 cigarettes or equivalent amount of tobacco in their life as per accepted methods [37]. Ex-smokers were considered to be those who had ever smoked 100 cigarettes and who were not currently smoking any tobacco products. At T1, T2, T3 and T4 current smokers were asked about their intention to quit and whether the symptoms, diagnosis or treatment of cancer influenced their quitting intentions. At T1, T2, T3 and T4 ex-smokers were asked about when they had quit (last 6 months, 12 months, 18 months) and whether symptoms, diagnosis or treatment of cancer had influenced their decision to quit.

Analyses

Frequencies and percentages are reported for each of the aims (Complete Case Analysis). Statistical analyses were programmed using SAS v9.4 (SAS Institute, Cary, North Carolina, USA).

RESULTS

Sample

A cohort of 3315 people newly diagnosed with one of the eight study cancers was invited to participate in the study; 1690 (51%) agreed to be contacted, and 1359 (80% of those contacted) completed a questionnaire at T1. Fewer participants completed the questionnaire at each follow-up time: T2 n=1270 (75% of contacted patients), T3 n=1117 (66%), T4 n=986 (58%). A total of 1444 participants responded to at least one questionnaire over the 4 time points (however not all participants had T1 data). People who returned a questionnaire at T1 indicating they were more than 9 months post-diagnosis (n=37), and those with incomplete cancer type information (n=2) are excluded from analyses, leaving 1407 participants providing data for at least one time point.

The cohort included people diagnosed with prostate cancer (n=375, 27%), melanoma (n=217, 15%), breast cancer (n=216, 15%), bowel cancer (n=166, 12%), Non-Hodgkin's Lymphoma (n=160, 11%), lung cancer (n=137, 9.7%), head & neck cancer (n=101, 7.2%) or leukaemia (n=35, 2.5%). See Boyes et al[36] for further sample characteristics.

Smoking status after diagnosis

After excluding missing data from participants who did not return a questionnaire, the number and percentage of current smokers, former smokers, and never-smokers at T1 was 112 (8.6%), 607 (47%) and 579 (45%) respectively. Participant smoking status at T2 included 100 (8.1%) current smokers, 586 (48%) former smokers, and 542 (44%) never smokers. The number and percentage of current smokers, former smokers, and never smokers were 71 (6.6%), 521 (48%), 486 (45%) at T3, and 58 (6.2%), 457 (48%) and 428 (45%) at T4. Participant quitting at baseline is reported in Table 2.

Of the 112 smokers at baseline, 9 (8.0%) reported having quit smoking by T2; 12 (10.7%) reported quitting by T3; and 13 (11.6%) reported quitting by T4. Where data on respondent smoking status was missing from T2 (n=290), T3 (n=420) or T4 (n=536),. If the participant did not respond to either T1 or any of the follow ups, change in smoking status could not be determined. . Of the 1186 who were never-smokers or former smokers at T1, 9 (0.8%) took up smoking by T2, 6 (0.5%) took up smoking

by T3 and 9 (0.8%) took up smoking by T4. The number of participants who changed smoking status was insufficient to explore potential relationships between changed smoking status and socio-demographic, disease or behavioural factors.

Patterns of quit attempts and the role of quit intentions

Of the smokers at each time point who answered the relevant item, 71% reported at T1 that they had made a quit attempt in the preceding 12 months, 65% and 52% reported making quit attempts in the 12 months prior to T2 and T3 respectively, and 44% reported making a quit attempt in the prior 18 months at T4. The numbers (and percentages) of participants who made a quit attempt in the preceding 12 (T1 T2 T3) or 18 (T4) months are displayed in Table 3.

Of the 45 who reported intending to quit at T1 (intending to quit in the next month or in the next 6 months), 5 (21%) or fewer reported having quit at each follow-up. The number (and percentage) of smokers and former smokers at each follow up, as a percentage of those who intended to quit at T1, are listed in Table 4.

Staying quit after a diagnosis:

At T1, 91 participants reported having quit smoking either 12 months prior to, or at diagnosis. Of those who responded to the relevant items at follow up, 67 (89%) reported still being quit at T2, 58 (92%) at T3, and 45 (87%) at T4. Conversely, 8 (11%) reported relapse to smoking at T2, 5 (7.9%) at T3 and 7 (13%) at T4.

DISCUSSION

The current study examined smoking prevalence, quitting intentions, and quitting behaviours among cancer survivors, at 6 months, 1 year, 2 years and 3.5 years post-diagnosis.

Smoking prevalence

Prevalence of smoking declined across the study (from 8.6% at T1 to 6.2% at T4). Although other data suggest smoking prevalence among patients diagnosed with cancer is higher (for example 33% among patients with lung or head and neck cancers [35]), this observed rate of smoking is similar to other studies reporting long term prevalence among survivors. For example, Westmaas et al [38] noted a smoking prevalence of 9.3% in a 9 year follow up of 2,938 cancer survivors. Other

Australian-based data [16] have reported a higher smoking prevalence among cancer survivors (21.3%), however no information was recorded about time since diagnosis. Although the current study did not permit direct comparisons with populations without a cancer diagnosis, other research suggests that the self-reported smoking prevalence among cancer survivors is higher (particularly for cancers that are directly tobacco-attributable) than people without a history of cancer [39].

Intention to quit

Encouragingly, approximately half (51%) of the current study sample who were smokers indicated they intended to quit following their diagnosis at T1. Just over half (53%) of those intending to quit indicated that they wanted to quit within the following six months. Only 14% of smokers at diagnosis reported no intention to quit at T1. A cancer diagnosis is in itself a prompt to quitting and is an opportunity for health care providers to address patient health behaviours [18]. However, the limited available evidence suggests that support for quitting smoking is not a routine feature of cancer care [29, 28]. While a diagnosis of cancer can increase reflective motivation for change, behavioural theories and frameworks (for example, the Behaviour Change Wheel [40] or the Theory of Planned Behaviour [41]) clarify the importance of other types of motivation (automatic [40]) in successful behaviour change. In addition, other factors such as opportunity and capability [40]; or social norms and behavioural control [41] play a role in quitting success. The data presented here and elsewhere [10] indicate that health care providers have a substantial role to play in assisting cancer survivors to use evidence-based smoking cessation support in order that their intention to quit is realised. Although patients with cancer are often motivated to quit smoking in the short term [32, 21] after diagnosis, evaluations of longer term intentions among cancer survivors is lacking. One recent study [42] documented a similar percentage (58%) to the current study of cancer survivors intending to quit smoking.

Actual quitting

In the current study, rates of quitting appeared to decline across the study time period. The highest rates of quit attempts were observed at T1 (74% of smokers making a quit attempt in the previous 12 months), followed by T2 (65%), T3 (52%) and T4 (44%). Of the 45 smokers who intended to quit at

T1, (intending to quit in the next month or in the next 6 months), 5 (21%) or fewer reported having quit at a later time point. Of the 91 former smokers who indicated they had quit at diagnosis (or in the preceding 12 months) at T1, 11% had resumed smoking at T2, 8% at T3, and 14% at T4. The rate of relapse observed here is at the lower end of other observed rates of relapse (ranging from 13%-60% [32, 43, 44]), although this could be reflective of the heterogeneous sample of cancers included in the current study (versus only tobacco-related cancers), a longer follow up time, and missing data. Interestingly, these relapse rates are not equivalent to those found in the general population. Research report higher relapse rates (50-80%) amongst cancer survivors, compared to that of the general population (18-24%) [45]. The potential disparity between the general population of smokers and those diagnosed with cancer may indicate that the level of nicotine dependence is greater among patients with cancer [45]. A review of smoking cessation trials with cancer patients found that pharmacotherapies increased the likelihood of successful quitting [27]. A small percentage of never-smokers or former smokers at T1 reported taking up smoking across the study (1% or less at T2, T3, or T4). Therefore, it is important that smoking cessation support for cancer patients includes pharmacotherapies and is offered with an understanding of the operation of addiction. In addition to this, a 2015 study investigating the role of second-hand smoke (SHS) exposure on smoking cessation in cancer patients has identified SHS exposure at home as a major barrier to quitting smoking for participants [46]. This further warrants the need for smoking cessation support and relapse prevention. Advice should be repeatedly offered over the long term as part of ongoing monitoring and surveillance of survivors in oncology clinics and primary care settings.

Limitations

There are several limitations to the current study that warrant consideration. Firstly, the lower response rate might mean that the true rate of smoking prevalence was underestimated. Smoking status was self-reported and may have been influenced by social desirability bias, resulting in an underestimation of true smoking rates. The CSS did not address smoking reduction, and it is possible that many continuing smokers decreased their tobacco consumption. Finally, there is a low to moderate rate of misreporting smoking status by patients with cancer [47] which can mean that rates of quitting are often over-estimated. However, some studies have shown that self-reported smoking

status [48, 49] and self-reported quitting behaviour [50] is sufficiently accurate and reliable for individuals including cancer patients.

Conclusions

A diagnosis of cancer may stimulate thoughts about smoking cessation and prompt quit attempts. However, the majority of smokers in this sample continue to smoke beyond diagnosis, despite a substantial minority having a stated intention to quit and making attempts to do so. There is a need to identify and implement effective cessation strategies for people with cancer who smoke, to both enhance self-efficacy and to capitalise on existing motivation to quit smoking.

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Table 1. Questionnaire time points and smoking questions

Smoking–related Questionnaire Items	Questionnaire Time			
	T1 (0.5 yr)	T2 (1 yr)	T3 (2 yr)	T4 (3.5 yr)
Would you have smoked at least 100 cigarettes or the equivalent amount of tobacco?	X			
Do you currently smoke any tobacco products?	X	X	X	X
If you don't currently smoke tobacco products at all, when did you quit?	X			
Were your cancer symptoms, diagnosis or treatment an important influence in your decision to quit?	X	X	X	
During the past 12 months have you quit smoking intentionally for one day or longer?	X			
Were your cancer symptoms diagnosis or treatment an important influence in your decision to quit?	X	X	X	
What are your intentions regarding quitting?	X	X	X	
Did you quit in the past 6 months?		X		
During the past 6 months have you quit smoking intentionally for one day or longer?		X		
Did you quit in the past 12 months?			X	
During the past 12 months have you quit smoking intentionally for one day or longer?			X	
Did you quit in the last 18 months?				X
During the past 18 months have you quit smoking intentionally for one day or longer?				X

Table 2. Participant quitting characteristics at T1

Questionnaire item	Response	n (%)
Quit smoking intentionally for one day or longer in past 12 months**	Yes	74 (71%)
	No	30 (29%)
When did you quit?*	After being diagnosed with cancer	66 (11%)
	In the 12 months before the cancer diagnosis	25 (4%)
	More than 12 months before the cancer diagnosis	514 (85%)
Intentions regarding smoking**	Will quit in next month	27 (25%)
	Will quit in next 6 months	18 (17%)
	May quit but not in next 6 months	12 (11%)
	Never expect to quit	15 (14%)
	Don't know	34 (32%)

* Asked of former smokers (n=607)
**Asked of current smokers (n=112)

*data may not add total sample size due to missing values

Table 3. Quit attempts in the preceding 12 (T1 T2 T3) or 18 (T4) months (among smokers and quitters)

Questionnaire Time*	Response	n (%)	95% CI
T1 (n=104)	Yes	74 (71)	(61, 80)
	No	30 (29)	(20, 39)
T2 (n=88)	Yes	57 (65)	(54, 75)
	No	31 (35)	(25, 46)
T3 (n=58)	Yes	30 (52)	(38, 65)
	No	28 (48)	(35, 62)
T4 (n=122)	Yes	54 (44)	(35, 54)
	No	68 (56)	(47, 65)

*data may not add total sample size due to missing values

Table 4. Smoking status at T2, T3 and T4 of those intending to quit at T1 (n=45)

Questionnaire time	Smoking status	n* (%)	95% CI
T2	Former	3 (8)	(1.6, 21)
	Current	35 (92)	(79, 98)
T3	Former	5 (17)	(5.8, 36)
	Current	24 (83)	(64, 94)
T4	Former	5 (21)	(7.1, 42)
	Current	19 (79)	(58, 93)

*Total n excludes missing responses (T2 n=7, T3 n=16, T4 n=21)