Support Care Cancer (2014) 22:2465–2472
DOI 10.1007/s00520-014-2220-5

ORIGINAL ARTICLE

Does perceived control predict Complementary and Alternative Medicine (CAM) use among patients with lung cancer? A cross-sectional survey

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Received: 10 October 2013 / Accepted: 12 March 2014 / Published online: 9 April 2014

Abstract
Purpose Scant literature exists on the use of complementary and alternative medicine (CAM) among patients with lung cancer. Preliminary data indicates that perceived control is an important factor leading patients to CAM. This study aimed to evaluate the relationship between perceived control and CAM use in patients with lung cancer.
Methods We performed a cross-sectional survey in patients with lung cancer under active treatment and follow-up at the oncology clinic of an academic medical center. Self-reported CAM use was the primary outcome. Multivariate logistic regression was performed to determine the relationship between perceived control and CAM use, controlling for other factors.
Results Among 296 participants, 54.4 % were female, 83.5 % were Caucasian, 57.6 % were ≤65 years old, 52.4 % were in stage IV, and 86.4 % had non-small cell lung cancer; 50.9 % of patients had used CAM, most commonly vitamins (31.5 %), herbs (19.3 %), relaxation techniques (16 %), and special diets (15.7 %). In multivariate analysis, CAM use was associated with having greater perceived control over the cause of cancer (adjusted odds ratio (AOR) 2.27, 95 % confidence interval (CI) 1.35–3.80), age≤65 (AOR 1.64, 95 % CI 1.01–2.67), higher education (AOR 2.17, 95 % CI 1.29–3.64), and never having smoked tobacco (AOR 2.39, 95 % CI 1.25–4.54). Nearly 60 % of patients who used CAM were receiving active treatment.
Conclusion Over half of lung cancer patients have used CAM since diagnosis. Greater perceived control over the cause of cancer was associated with CAM use. Given the high prevalence of CAM, it is essential that oncologists caring for patients with lung cancer discuss its use.

Keywords Integrative medicine · Complementary and alternative medicine · Prevalence · Lung cancer · Locus of control · Perceived control · Smoking

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Background

Lung cancer remains the leading cause of cancer death in the USA and is a major source of symptom burden [30, 36, 38]. Compared with other common malignancies, the symptom distress experienced by patients with lung cancer is more severe and persistent, which has a detrimental effect on quality of life [8, 33]. Impaired quality of life is associated with a worse prognosis in lung cancer [26], and emerging data suggest interventions aimed solely at improving quality of life may prolong survival [39]. The mechanism underlying this survival advantage remains unclear, though this is an area of active research [17]. The potential for improved overall survival further emphasizes the importance of providing evidence-based supportive care. Unfortunately, the relative scarcity of supportive care research among patients with lung cancer makes such integration difficult. As a result, many

patients turn to complementary and alternative medicines (CAM) to alleviate their symptoms.

CAM utilization among patients with cancer has increased in recent years, and many patients use CAM to improve their quality of life [24, 32]. Depending upon the cancer population studied, estimates of CAM use range from 30 to 90 %. CAM use has historically been associated with female gender, younger age, lack of tobacco exposure, and a higher level of education [21, 29, 32, 35, 42].

CAM use has also been associated with a greater sense of perceived control among patients with breast cancer [16]. Perceived control is defined by the American Psychological Association as "the belief that one has the ability to make a difference in the course or consequence of some event or experience" [15]. When applied to cancer, this refers to control over why an individual got cancer as well as the treatment outcome [40]. Patients with cancer may utilize CAM as a way to regain control of issues both directly related to their cancer treatment as well as more global problems, which they may attribute to the cause of their cancer from a holistic perspective [1, 31, 34].

Despite growing literature on CAM use in cancer, scant data exist among patients with lung cancer. Population studies do not include a proportional number of patients with lung cancer, and lung cancer-focused studies have had small sample sizes [25, 41]. Amichai et al. performed a qualitative assessment of 12 patients with lung cancer regarding their use of CAM and noted that perceived control was a critical factor involved in CAM use in this population [1]. No study to date has quantitatively evaluated the impact of perceived control on CAM use in lung cancer. Tobacco use is the known cause of cancer in the majority of patients, so perceived control over cancer has different psychological implications compared to other malignancies where the cause is unknown [11]. Never smokers will likely have a very different perception of their control over their cancer as compared to former or current smokers, but this has never been evaluated.

The dearth of data regarding factors associated with CAM use among patients with lung cancer, along with the likely divergent nature of perceived control in this population, motivated us to quantify the prevalence of and identify the factors associated with CAM use in patients with lung cancer with a specific focus on perceived control. Our hypotheses were (1) patients with lung cancer will have utilized CAM at a rate at least comparable to that seen in studies evaluating patients with multiple cancers, if not higher; and (2) a higher degree of perceived control over their cancer cause and treatment outcome will be associated with CAM use. As a secondary aim, we explored the relationship between tobacco exposure and perceived control.

Methods

Study design and patients

We conducted a cross-sectional survey study among a consecutive convenience sample of patients seen in the outpatient thoracic oncology clinic at the Hospital of the University of Pennsylvania between June 2010 and October 2011. Eligible participants were aged 18 years or older and had a primary diagnosis of lung cancer and a Karnofsky score of ≥60 (i.e., ambulatory). We did not exclude patients based on lung cancer stage or subtype (small cell lung cancer (SCLC) or non-small cell lung cancer (NSCLC)), cancer recurrence status, treatment types or status. Additional inclusion criteria stipulated the approval of the patient's oncologist and the patient's ability to understand and provide informed consent in English. Once the oncologist approved the patient's enrollment, they had no access to the patient's survey responses. Trained research assistants screened medical records and approached potential study subjects in the waiting area of the oncology clinic. After providing informed consent, each participant was given a self-report survey. The Institutional Review Board of the University of Pennsylvania approved the study.

CAM use: primary outcome

To measure CAM use, we asked patients, "Have you used the following CAM therapies since your cancer diagnosis?" CAM modalities included acupuncture, chiropractic care, special diet, energy healing (e.g., reiki, qi gong), expressive arts therapy, herbs, homeopathy, massage, relaxation techniques (e.g., mindfulness-based meditation, deep breathing), vitamins (besides a daily multivitamin), yoga, tai chi, or other. Prayer for healing was not included since our group had previously found that this had a different epidemiologic distribution from other CAM modalities [23]. Our group developed this instrument based upon CAM modalities commonly used in the 2002 National Health Interview Survey. The modalities included accounted for 92 % of CAM usage in the survey [22]. Participants were dichotomized into two groups based on survey response: those who had used one or more of these modalities versus those who had not used any of these modalities.

Perceived control: primary independent variable

Perceived control was measured using the Cancer Locus of Control Scale [40]. Originally designed in Dutch to evaluate perceived control among cancer patients, it was then translated and validated in 68 English-speaking patients with cancer by Watson et al. This 17-item instrument was found to be reliable and separates perceived control into three subdomains: control

over the cause of cancer, control over treatment outcome (course of cancer), and religious control. The Cronbach alpha for the subdomains ranged from 0.77 to 0.80. Because the distribution of the scores was not normal, we dichotomized the scores into no/low versus medium/high control for ease of interpretation, using methods described by Henderson et al. [16].

Covariates

We queried patients about their perceived health status. Patients were asked, "How would you rate your health in general?" with five options ranging from "poor" to "excellent." This single-item question has been incorporated in multiple epidemiologic studies [9].

Participants self-reported sociodemographic variables including gender, age, race/ethnicity, tobacco exposure history, and education level. Chart abstraction was performed using the electronic medical record to determine cancer subtype, cancer stage, and treatment status (not yet treated, receiving treatment, or post therapy). Staging was based upon the seventh edition of the American Joint Committee on Cancer Lung Cancer Staging Algorithm for both SCLC and NSCLC.

Statistical analysis

The sample size was estimated based upon an expected relative risk for CAM use in the setting of greater perceived control over cause of 1.4. This was a conservative estimate based upon the work of Henderson et al. [16]. Based upon this, we would have 90 % power to detect this size difference with a sample size of 242 patients. We performed statistical analyses using Stata software (Mac version 12.0, StataCorpLP, College Station, TX). Descriptive statistics were used to examine the distribution of the outcomes and covariates. Next, we used χ^2 tests to identify which covariates were associated with CAM use. Multivariate logistic regression analyses were conducted to identify independent predictors of CAM use, using only variables that had a p value of ≤ 0.05 in the χ^2 analyses. For the secondary analysis, χ^2 tests were used to evaluate the association of smoking history with degree of perceived control. All analyses were two-sided at a significance level of 0.05.

Results

Of the 382 consecutive patients approached, 340 (89 %) agreed to participate. The main reasons for patients to decline participation in the survey included lack of interest 35 (9.2 %) or an inability to complete the survey due to time or sickness 7 (1.8 %). Additionally, 12 subjects withdrew consent, 11 subjects did not return the survey, and 21 subjects were excluded from the analysis due to incomplete data, thus resulting in the final sample of 296 (see Fig. 1). This population reflected a response rate of 77.5 % among eligible subjects.

The mean age of participants was 63.1; 45.6 % of patients were male. Caucasians made up 83.5 % of the sample; the remainder included 12.5 % African Americans, 2.7 % Asian Americans, and 0.34 % Native Americans. NSCLC was the diagnosis in 86.4 % of patients, and 52.4 % of patients had stage IV disease; 55.5 % of patients surveyed were currently undergoing therapy. Of the patients in our sample, 38.8 % perceived a medium/high degree of control over the cause of their cancer, while 93.9 % of patients perceived a medium/high degree of control over their treatment outcome (Table 1). Among participants (n=296), 50.9 % reported CAM use. The most common modalities included vitamins (31.5 %), herbs (19.3 %), relaxation techniques (16 %), and special diets (15.7 %) (Fig. 2).

On univariate analysis, greater perceived control over the cause of cancer was associated with CAM use (p=0.02), but perceived control over treatment outcome (p=0.94) and religious control (p=0.75) were not. Younger age (p=0.02), higher education (p<0.001), and never having smoked tobacco (p=0.007) were also associated with CAM use. Gender (p=0.54) and race (p=0.78) were not significantly associated with CAM use (Table 2). After adjusting for other covariates, a higher degree of perceived control (p=0.002), age of ≤65 years old (p=0.047), having a minimum of a college degree (p=0.003), and never-smoker status (p=0.008) were associated with CAM use (Table 3); 57.8 % of patients who used CAM were actively receiving therapy. On sub-analysis of patients who had taken herbs or vitamins (n=150), 96 (64 %) were actively receiving therapy.

Individuals who were former or current smokers more likely to perceive a higher degree of control over the cause

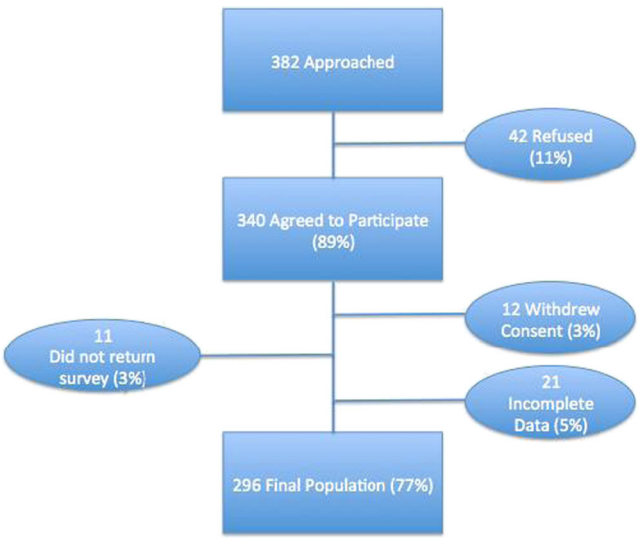

Fig. 1 Flow diagram

Table 1 Demographics and clinical characteristics

		Number (%)
Gender	Male	135 (45.6)
	Female	161 (54.4)
Race	Caucasian	247 (83.5)
	African American	37 (12.5)
	Asian	8 (2.7)
	Native American	1 (0.34)
	Other	3 (1.0)
Age	Less than or equal to 65	170 (57.6)
Mean 63.1 (10.8)	Over 65	125 (42.4)
	Missing	*1 (0.34)*
Education	Less than a college degree	190 (64.2)
	College degree or more	106 (35.8)
Smoking history	Current smoker	32 (10.9)
	Former smoker	201 (68.1)
	Never smoker	62 (21.0)
	Missing	*1 (0.34)*
Cancer type	NSCLC	253 (86.4)
	SCLC	33 (11.3)
	Other	7 (2.4)
	Missing	*3 (1)*
Cancer stage	I	36 (12.2)
	II	28 (9.52)
	III	76 (25.9)
	IV	154 (52.4)
	Missing	*2 (0.7)*
Treatment history	Surgery to remove cancer	118 (39.9)
	Chemotherapy	248 (83.8)
	Radiation therapy	160 (54.1)
	Immune therapies	35 (11.8)
Treatment phase	Prior to therapy	13 (4.5)
	Currently in therapy	162 (55.5)
	Completed therapy	98 (33.6)
	Other	19 (6.5)
	Missing	*4 (1.3)*
CAM utilization	Yes	150 (50.9)
	No	145 (49.2)
	Missing	*1 (0.34)*
Perceived health status	Fair/poor	69 (23.3)
	Good/very good/excellent	227 (76.7)
Control over cause	No/low control	181 (61.2)
	Medium/high control	115 (38.8)
Control over outcome	No/low control	18(6.1)
	Medium/high control	278 (93.9)
Religious control	No/low control	93 (31.4)
	Medium/high control	203 (68.6)

The italics indicate where data is missing

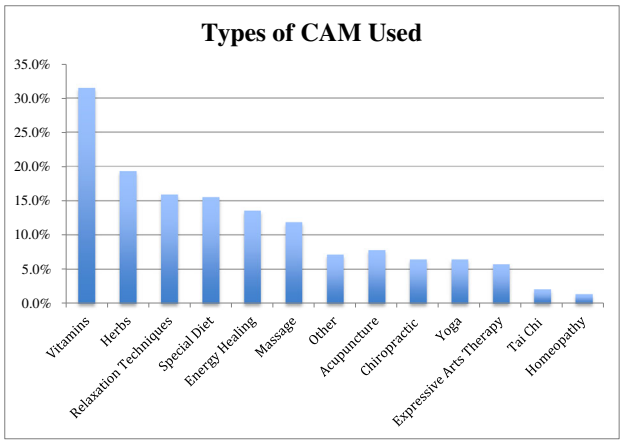

Fig. 2 Types of CAM used

of their cancer than patients without a tobacco use history ($p<0.001$, Table 4). There was no significant difference in perceived control over treatment outcome or degree of religious attribution of control between smokers and never smokers.

Discussion

Interest in CAM use among cancer patients has surged in recent years, but scant literature exists regarding the use of CAM among patients with lung cancer. In the largest evaluation to date, we found that slightly over half of our patients with lung cancer had used CAM since diagnosis. While greater perceived control over the cause of cancer was associated with CAM use, greater perceived control over treatment outcome was not.

One previous study in Europe found that CAM use was relatively infrequent in patients with lung cancer [25], but that study only had 111 patients with a relatively low level of education. Another prior study performed in the USA revealed CAM use in 44 % in patients with lung cancer, but that study focused exclusively on women and included prayer in their definition of CAM [41]. Our data indicate that CAM use among patients with lung cancer mirrors rates seen in larger cancer population-based studies [23, 24]. It is also consistent with a prior population study which indicated a relatively high CAM utilization rate among patients with lung cancer compared with other cancers [29]. Contrary to what one may expect based solely on the demographic features most commonly associated with CAM use (e.g., female gender, never-smoking status), patients with lung cancer are indeed using CAM modalities. This is an important topic for future prospective research.

The association of CAM use with younger age, greater education, and a lack of an exposure to tobacco has been well established previously in population-based studies [13, 21, 32, 35, 42] and in a smaller previous study evaluating CAM use

Table 2 Characteristics related to CAM use

		CAM use (%)	χ^2 p value
Gender	Male	66 (48.9)	0.54
	Female	84 (52.5)	
Race	Caucasian	127 (51.6)	0.78
	African American	17 (46.0)	
	Asian	4 (50.0)	
	Native American	0 (0)	
	Other	2 (66.7)	
Age	Less than or equal to 65	96 (56.5)	0.02
	Over 65	54 (43.2)	
Education	Less than college degree	82 (43.4)	<0.001
	College degree or more	68 (64.2)	
Smoking history	Ever smoker	109 (46.8)	0.007
	Never smoker	41 (66.1)	
Cancer type	NSCLC	133 (52.6)	0.14
	SCLC	12 (37.5)	
	Other	2 (28.6)	
Cancer stage	I	19 (54.3)	0.24
	II	10 (35.7)	
	III	35 (46.1)	
	IV	84 (54.65)	
Treatment phase	Prior to therapy	5 (38.5)	0.07
	Currently in therapy	93 (57.8)	
	Completed therapy	41 (41.8)	
	Other	10 (52.6)	
Perceived health status	Fair/poor	39 (56.5)	0.28
	Good/very good/excellent	111 (49.1)	
Control over cause	No/low control	82 (45.3)	0.02
	Medium/high control	68 (59.7)	
Control over outcome	No/low control	9 (50)	0.94
	Medium/high control	141 (50.9)	
Religious control	No/low control	46 (49.5)	0.75
	Medium/high control	104 (51.5)	

among patients with lung cancer [41]. In contrast, prior literature had indicated that women were more likely to utilize CAM [13, 21, 32, 35, 42], which we did not find in our population. This distinction may be secondary to the inclusion of more breast cancer patients in prior population studies, given the high rate of CAM use in breast cancer relative to other cancers [13, 23, 29, 35]. Supporting our observation, a study from Sweden demonstrated no gender disparity in CAM use among patients with lung cancer [20].

The lack of an association of CAM use with perceived control over treatment outcome is unexpected and novel. Among patients with breast cancer, one of the strongest predictors of CAM use is a perception that one will be able to influence treatment outcome [16]. The lesser association among patients with lung cancer may be related to prognosis. While over 50 % of the patients in our study were incurable at diagnosis, less than 25 % of patients with breast cancer present with incurable disease [36]. This may induce a type of therapeutic nihilism, whereby patients are less likely to undertake an intervention with a hope of affecting treatment outcome. Patients with breast cancer also tend to desire a high degree of control over their treatment decisions [2], and this is amplified among CAM users [4]. As a result, the association of CAM use with control over treatment outcome may be a unique correlation in patients with breast cancer.

The strong association of CAM use with perceived control over the cause of cancer is also a new finding. In a prior study, a majority of patients with lung cancer admitted that their lung cancer was caused by smoking, but 81 % then went on to qualify this response by stating that tobacco was only partially responsible. In addition, the degree of causal attribution varied over time, and a higher degree of causal attribution was associated with a worse quality of life [11]. This stands in stark contrast to breast and colon cancers, where the degree of

Table 3 Multivariate logistic regression predicting CAM usage

	Univariate			Multivariate		
	OR	95 % Confidence interval	p value	aOR	95 % Confidence interval	p value
Age			0.024			0.047
Greater than 65	1			1		
Less than or equal to 65	1.71	1.07–2.72		1.64	1.01–2.67	
Education			0.001			0.003
Less than college degree	1			1		
College degree or more	2.33	1.43–3.81		2.17	1.29–3.64	
Control over cause			0.016			0.002
No/low control	1			1		
Medium/high control	1.78	1.11–2.87		2.27	1.35–3.80	
Tobacco history			0.008			0.008
Ever smoker	1			1		
Never smoker	2.22	1.24–3.99		2.39	1.25–4.54	

OR odds ratio, *aOR* adjusted odds ratio

Table 4 Association of perceived control with smoking history

		Ever smokers (%)	Never smokers (%)	χ^2 p value
Control over cause	No/low control	128 (54.7)	53 (85.5)	<0.001
	Medium/high control	106 (45.3)	9 (14.5)	
Control over outcome	No/low control	14 (6)	4 (6.5)	0.89
	Medium/high control	220 (94)	58 (93.5)	
Religious control	No/low control	71 (30.3)	22 (35.5)	0.44
	Medium/high control	163 (69.7)	40 (64.5)	

perceived control over the cause of cancer remains constant over time and is associated with improved quality of life [3, 6, 18]. This distinction may be secondary to the societal stigma attached to lung cancer, which has been shown to have a profound negative impact on patients' lives [5]. Patients may be using CAM modalities, which are widely viewed as health promoting [1, 32], as a means to overcome the stigma attached to lung cancer.

In our secondary analysis, we found that former and current smokers have greater perceived control over the cause of their cancer. One hypothesis for the finding that both patients with a medium/high degree of perceived control over the cause of their cancer (largely current and former smokers) and never smokers (who had a low degree of perceived control over the cause of their cancer) were using CAM is that these represent two distinct groups. Both pathways, being a never smoker without perceived control and being a former smoker with higher perceived control, can lead to CAM use. This is consistent with a prior qualitative work, which shows that patients with lung cancer may be driven to CAM use by multiple factors [1]. The relationship between perceived control over cause and CAM use requires further investigation in a prospective fashion to evaluate the direction of causality, if present.

Given the high rate of CAM use documented in our and other studies, communication about CAM use should be an essential aspect of oncologic care. Unfortunately, a majority of patients using CAM do not discuss its use with their oncologists [10, 14]. Some patients cited concern that their oncologist would judge their use of CAM harshly, but emerging data indicate that oncologists may be open to integration of CAM into their patients' care [19]. A frank discussion is important to allow education of potential interactions and prevent toxicities [12, 37]. For example, despite the legitimate concerns among clinicians that some herbs and vitamins may affect chemotherapy levels or even be tumor protective from anticancer therapies [7, 28], the most common forms of CAM used in our study were herbs and vitamins. Since over 60 % of patients who used these modalities were actively receiving anticancer therapy, more research should focus on how to efficiently and effectively engage patients and providers to discuss CAM use in oncology setting.

Our study had a number of important limitations. First, the cross-sectional design limits any causal conclusions. In addition, our CAM measurement yielded a binary grouping of CAM users and CAM nonusers. While this gave us the statistical power to answer the broader question as stated, it did not capture the more subtle nuances of CAM use (e.g., very brief exposure to CAM versus those who utilize multiple CAM modalities on a daily basis). Further study should more closely quantify CAM use in a prospective fashion. Next, our population contained more women than men, which is distinct from the epidemiology of lung cancer [36]. This is likely due to the improved prognosis women with lung cancer have relative to men [27]. Lastly, our sample was drawn from an urban academic cancer center, therefore limiting its generalizability to community settings.

Despite these limitations, our study is the largest to date to evaluate CAM use among only lung cancer patients. Given the high degree of morbidity in this population and the fact that CAM is often used to improve quality of life, this population represents an important group to study. Over half the patients surveyed had used some form of CAM since their diagnosis, so it is clearly important for oncologists caring for patients with lung cancer to inquire about CAM use. In addition, this observation underscores the importance of continued research into evidence-based integration of these practices into usual clinical care. Such research represents an important opportunity to improve symptom management and quality of life for patients with lung cancer.

Acknowledgments We would like to thank all of the patients who participated in this study. We thank the physicians, nurse practitioners, and staff for their support. We would like to thank our hardworking students, Eitan Frankel, Jonathan Burgess, Blake Freidman, Manuel Bramble, Neha Agarwal, and Tiffany Tan for their dedication to the data collection and management process. We thank Mr. Duncan Hennes for his support of the Penn Integrative Oncology Program.

Conflict of interest This study is partially funded by the Penn Institute of Aging Pilot Fund. Dr. Mao is supported by the National Institutes of Health [1K23 AT004112-05]. The content is solely the responsibility of

the authors and does not necessarily represent the official views of the National Institutes of Health. The authors have full control of the primary data, which is available to the journal at their request for review.

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