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ORIGINAL REPORT

National Survey of US Oncologists' Knowledge, Attitudes, and Practice Patterns Regarding Herb and Supplement Use by Patients With Cancer

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ABSTRACT

Purpose
Patients with cancer commonly use complementary and alternative medicine, including herbs and supplements (HS), during cancer treatment. This national survey explored oncologists' knowledge, attitudes, and practice patterns regarding HS use by their patients.

Methods
A survey was sent by mail and e-mail to a random sample of 1,000 members of the American Society for Clinical Oncology. The questions covered several topics: communication patterns, attitudes about HS, education about HS, response to HS use among hypothetical patients with cancer, knowledge of HS adverse effects, and demographic information.

Results
Among eligible oncologists, 392 (42%) responded to the questionnaire. Most were white (75%) men (71%), with a mean age of 48 years (standard deviation, 9.8 years). On average, oncologists discussed use of HS with 41% of their patients; only 26% of discussions were initiated by the oncologist. Two of three oncologists indicated they did not have enough knowledge to answer questions from patients regarding HS, and 59% had not received any education about the topic. Physician factors associated with having initiated discussions with patients about the use of HS included female sex, higher self-reported knowledge, prior education about HS, increased knowledge about HS adverse effects and interactions, and estimating that > 40% of one's patients with cancer use HS.

Conclusion
Fewer than one half of oncologists are initiating discussions with patients about HS use, and many indicate that lack of knowledge and education is a barrier to such discussions. Improving physician education about HS may facilitate more physician-patient communication about this important topic.

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INTRODUCTION

Oncologists commonly discuss with patients options for treating cancer, and as interest in and use of complementary and alternative medicine (CAM) has grown, so too have questions about the use of CAM for cancer treatment. The use of CAM increased in the United States among adults from 33.8% in 1990 to 42.1% in 1997,[1] and studies suggest the prevalence of CAM use among patients with cancer exceeds that found among the general population. In 2000, a study from MD Anderson Cancer Center reported patient use of CAM at 68.7%, even after excluding spiritual and psychotherapy practices, and 88.2% of patients with advanced cancer enrolled onto phase I clinical trials at the Mayo Clinic reported using CAM.[2,3] A similar prevalence has been documented in pediatric populations.[4] The study conducted at MD Anderson Cancer Center also documented limited communication and discrepant views regarding CAM therapies.[5] Similarly, in an international study, we found limited communication between patients and oncologists regarding CAM.[6] In that study, despite reporting limited formal training about CAM therapies, nearly two thirds of oncologists indicated they would allow patients to use CAM during treatment of a curable cancer.

The prevalence of CAM use looms important, because many biologically based CAM modalities, such as herbs and supplements (HS), can interfere with chemotherapy efficacy and/or increase the risk

for treatment-related toxicity and other complications. St John's wort, Panax ginseng, and green tea have all been found to have toxicities and to interact with medications, including chemotherapies.[7-10] One study of adult patients with cancer estimated that 28% of patients were at risk for herbal interactions, and notably, 46% of these at-risk patients were being treated with curative intent.[11] A more recent study of patients with ovarian cancer estimated that 40% were at risk of an interaction between the HS they were taking and their prescribed chemotherapy.[12] Because HS use is prevalent and poses substantial risks to some patients, especially those undergoing active treatment, physicians are obligated to learn about commonly used HS and to inquire about patients' use of such therapies.

Research indicates that patients want to discuss the use of CAM with their clinicians,[13] but little is known about whether and how oncologists specifically discuss the use of HS with their patients. To explore this area further, we conducted a national survey of US oncologists to explore their knowledge, opinions, and practices regarding the use of CAM by patients, focusing particularly on HS. We hypothesized that oncologists would report limited knowledge about HS and limited discussions with patients about such use and that they would underestimate the prevalence of HS use by patients.

METHODS

Participants were selected from the American Society for Clinical Oncology (ASCO) membership directory from the year 2008. Among those members who listed their specialty as medical oncology or medical oncology/hematology, provided a US mailing address, and provided an e-mail address, we selected at random 1,000 oncologists (approximately 5% of medical oncologists from directory). An initial mailing notified them that an e-mail would be sent asking for their participation in this study; it included a $5 gift card to Starbucks as a token of appreciation and survey incentive. Several days later, an e-mail was sent to all participants, using the address included in the ASCO directory. The e-mail included a unique URL link to a confidential Web-based questionnaire. When requested, we mailed or faxed a paper version of the questionnaire. Brief e-mail reminders were sent to nonresponders on a weekly basis for up to 8 weeks. In addition, those who had not responded by the end of the fourth week were mailed a paper version of the questionnaire with a self-addressed stamped return envelope. Recipients were considered eligible if their questionnaire was not returned undeliverable and if they reported actively practicing medical oncology/hematology. The study was approved by the institutional review board of the University of Chicago.

Questionnaire

The questionnaire was constructed by two of the authors (R.T.L., F.A.C.), and a focus group of oncologists refined the wording of questions and response elements for clarity. At the outset, participants indicated whether they were actively practicing hematology/oncology (if not, we asked them not to complete questionnaire). In the first section, participants were asked about the prevalence of HS use by patients, how they communicated with patients regarding HS, and whether they encouraged, discouraged, or were neutral about the use of HS (eg, "Please estimate the percentage of your patients who currently use herbs and/or supplements"). We defined HS in the survey as follows: "substances found in nature (such as vitamins, minerals, and herbs) that are taken at levels higher than those found in a typical diet. Some examples of herbs include gingko and St. John's Wort; while examples of supplements include mega-dose vitamins, glucosamine, and fish oil (*NOT* including standard doses of vitamins and minerals such as those in a multivitamin)." Lastly, if participants reported they did discuss the issue of HS with patients, we asked them to indicate how such discussions affected their physician-patient relationships. In the second section, participants indicated their agreement (ie, strongly agree, agree, disagree, or strongly disagree) with several statements about HS (eg, "I know enough to answer patients' questions about herbs and supplements"), and they indicated whether they personally used CAM therapies. The third section included two clinical vignettes. The first read as follows:

"You have just seen a newly diagnosed cancer patient. With chemotherapy, the patient has a less than 5% chance of 5 year survival and a median survival of less than 1 year. The patient tells you that he wants to combine treatment with the use of an unfamiliar herb about which there is limited published information."

The second vignette was the same, except that the patient had an 85% chance of 5-year survival with chemotherapy. After each vignette, participants were asked to indicate: "In this case, would you most likely [strongly discourage, discourage, neutral opinion, encourage, strongly encourage, other] use of the herb."

To assess participants' knowledge, we asked four questions regarding herbs that have documented potential harms for patients with cancer (eg, "A man with metastatic colon cancer is being treated with irinotecan. He wants to use the following supplements and herbs. Which one(s) should he avoid?") For all four questions, response categories were: St John's wort, soy extract, gingko biloba, kava extracts, none of the above, and don't know. Respondents were asked to mark all answers that applied. Lastly, participants were asked to provide demographic information, including age, race, practice type, and religion.

Statistical Analysis

All data were coded and checked for errors by the principal investigator. Missing and ambiguous responses were excluded from analysis. Descriptive statistics (ie, frequency distribution, mean [± standard deviation (SD)], and median [range]) were used to summarize oncologist characteristics and outcome variables. Wilcoxon signed rank sum tests were performed to test for significant differences in the distribution of responses regarding the hypothetical patient with a curable cancer, as compared with those regarding the patient

Table 1. Respondent Characteristics (N = 392)

Characteristic	No.	%
Age, years		
Mean	48.4	
SD	9.8	
< 40	67	17.1
40-49	86	21.9
50-59	82	20.9
> 60	45	11.5
Sex		
Male	277	70.7
Female	111	28.3
Practice setting		
Academic	160	40.8
Community with academic affiliation	79	20.2
Community	148	37.8
Race		
Black	7	1.8
Hispanic	21	5.4
East Asian or Pacific Islander	30	7.7
South Asian or Indian	41	10.5
White	275	70.2
Other	9	2.3
Personal use of CAM		
Yes	134	34.2
No	258	65.8
Involved in clinical trial enrollment		
Yes	356	90.8
No	30	7.7

NOTE. Percentages may not add up to 100% because of missing values.
Abbreviations: CAM, complementary and alternative medicine; SD, standard deviation.

with incurable cancer.[14] χ^2 tests were performed to explore associations between oncologist characteristics and CAM practice patterns.[15] Multivariable logistic regression models were used to determine whether associations persisted after controlling for demographics and other relevant predictors.[16] Model building began with all variables having a P value $\leq .20$ from the χ^2 tests. A P value cutoff of .10 to enter and .05 to remain in the model were used. Age, sex, and race were kept in the model regardless of their significance. Once the list of variables to be used in our final model was selected, the functional form of each variable and multicollinearity between the variables were examined. All statistical analyses were performed using SAS software (version 9.3; SAS Institute, Cary, NC).

RESULTS

Among the 1,000 physicians randomly selected, 63 had nonworking addresses for both e-mail and postal mail; 24 were not actively practicing medical oncology/hematology, and seven did not indicate their specialty. A total of 392 participants responded for an adjusted response rate of 42%. Most (73%) responded online, and 98% of respondents completed at least 70% of the questions. Participants were from all 50 states and were predominantly men (71%), white (75%), and practicing in the community (58%), with a mean age of 48 years (SD, 9.8 years). One third of participants reported personal use of CAM therapies in the previous year (Table 1).

On average, respondents estimated that 34% (SD, 18.1%) of their patients were using HS and that they spoke with 41% (SD, 26.7%) of their patients about HS. Only one fourth of these discussions were initiated by oncologists. Oncologists were much more likely to believe that discussing HS strengthened their relationships with patients (40%) than they were to believe that it weakened the relationships (3%). Most (86%) reported providing chemotherapy to at least one patient in the previous 12 months who was concurrently taking HS, and on average, they estimated they had provided chemotherapy to 19 such patients in the past year (Table 2). When presented with a hypothetical patient with a potentially curable cancer, 80% of oncologists would actively discourage the use of an unknown herb with chemotherapy; however, when presented with a patient with an incurable cancer, only 37% would do so (with 48% remaining neutral). Regardless of the curability of the cancer, nine (90%) of 10 oncologists indicated they would likely provide chemotherapy even if the patient insisted on using the unknown herb (Table 3).

A majority (93%) of oncologists were concerned about potential interactions between HS and ongoing treatments, as well as about how

Table 2. Oncologists' Communication and Practice Patterns With Patients Regarding Herbs and Supplements (N = 392)

Pattern	No.	%
Communication		
Please estimate the percentage of your patients that currently use herbs and/or supplements (not including standard doses of vitamins and minerals such as those in a multivitamin)?		
Mean		34
SD		18.1
In the past 12 mo, with approximately what percentage of your patients have you discussed the topic of herbs or supplements?		
Mean		41
SD		26.7
Please estimate what percentage of these discussions about herbs or supplements were initiated by you.*		
Mean		26
SD		27.9
Overall, do you think talking about the use of herbs and supplements has strengthened or weakened your relationship with patients?*		
Strengthens	152	40.4
Weakens	12	3.2
Neutral/no effect	204	54.3
Other	6	1.6
Practice		
In the past 12 mo, have you ever administered chemotherapy to a patient who you knew was also taking an herb and/or supplement?	335	85.5
If yes, approximately how many patients?		
Mean		19
SD		15.6
Please indicate whether you have ever recommended to patients the following CAM therapies?		
Alternative medical systems	62	15.8
Mind-body therapies	247	63.0
Body manipulation	174	44.4
Energy therapies	58	14.8
Acupuncture	158	40.3
Other CAM therapy	34	8.7

Abbreviations: CAM, complementary and alternative medicine; SD, standard deviation.
*Sample included oncologists who have discussed herbs and supplements with patients (n = 376).

Table 3. Oncologists' Communication Approaches to Clinical Scenarios (N = 392)

	Curable Cancer		Incurable Cancer		
Scenario	No.	%	No.	%	P*
The patient tells you that he wants to combine treatment with the use of an unfamiliar herb about which there is limited published information. In this case, would you most likely:					< .01
Strongly discourage the use of the herb	190	48.5	49	12.5	
Discourage the use of the herb	123	31.4	94	24.0	
Express a neutral opinion on the use of the herb	54	13.8	187	47.7	
Encourage the use of the herb	0	0.0	27	6.9	
Strongly encourage the use of the herb	0	0.0	6	1.5	
Other response	20	5.1	24	6.1	
If the patient insists on combining the unfamiliar herb with chemotherapy, how likely would you be to provide cancer treatment?					.49
Very likely	284	72.4	277	70.7	
Somewhat likely	77	19.6	88	22.4	
Not very likely	20	5.1	18	4.6	
Not at all likely	8	2.0	3	0.8	

NOTE. Participants were given the following scenario for patient with curable cancer: "You have just seen a newly diagnosed cancer patient. With chemotherapy, the patient has an 85% chance of 5 year survival and a median survival of > 10 years. The patient tells you that he wants to combine treatment with the use of an unfamiliar herb about which there is limited published information. In this case, would you most likely . . ." For the incurable patient case, 5-year survival was changed to < 5%, and median survival was changed to < 1 year.
*Wilcoxon signed rank sum test (excluding Other response).

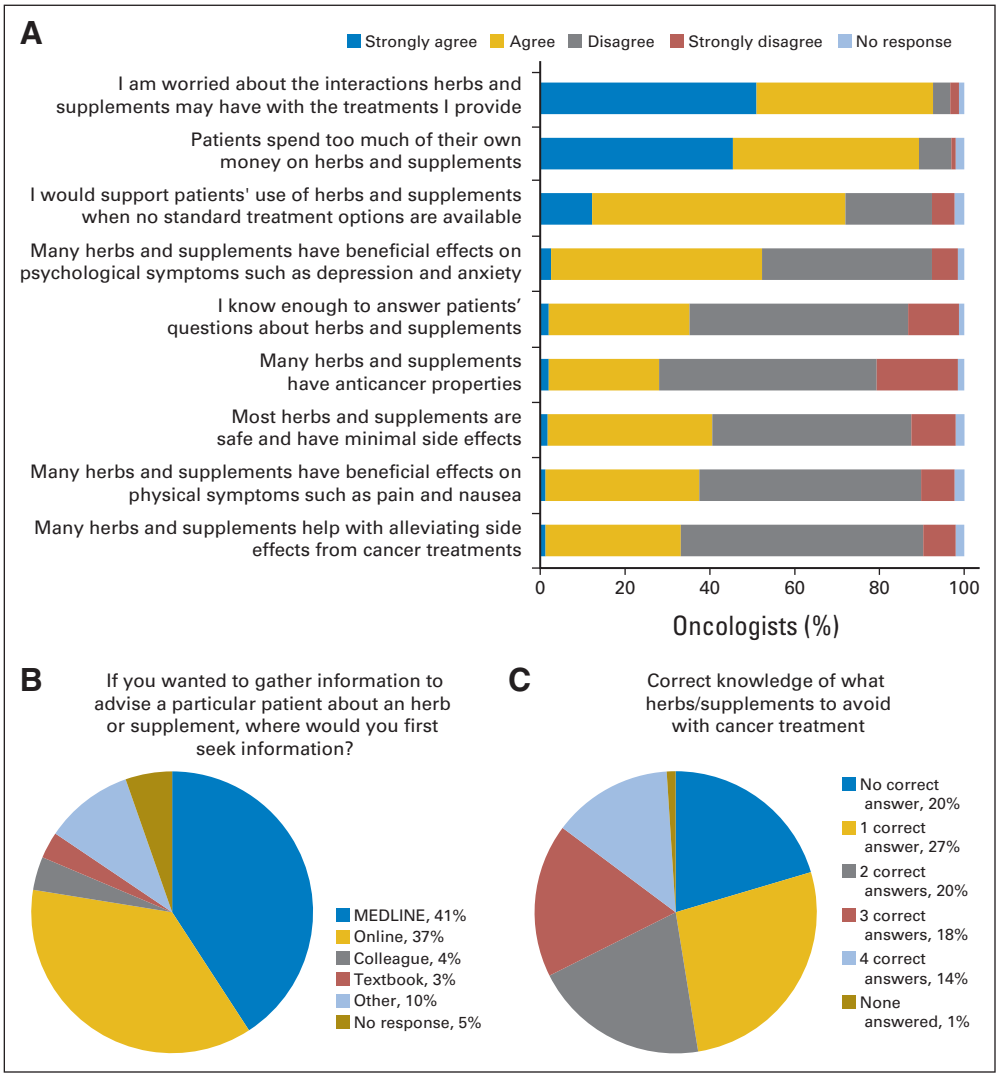

Fig 1. Oncologists' opinion patterns and knowledge about herbs and supplements (N = 392). (A) Percent of oncologists who agreed or disagreed with various statements about herbs and supplements (HS); (B) preferred sources of information about HS; (C) No. of questions about HS answered correctly by oncologists.

much money patients spent on HS (89%). Two (64%) of three did not believe they knew enough to answer their patients' questions about HS, and fewer than half reported receiving any education on the topic. For those who had received some education, this was most commonly gained through informal discussions (76%) or lectures (70%), followed by conferences (38%), courses (14%), and other practices (31%; Fig 1).

When asked about four specific HS-chemotherapy interactions, oncologists answered correctly about St John's wort and irinotecan (48%), gingko biloba and bleeding risk (39%), breast cancer and soy extracts (61%), and kava and liver damage (26%). Overall, only one third (32%) correctly answered at least three of the four questions, and 26% to 52% marked "I don't know" (respondents could mark more than one response category).

Multivariable Analysis

We explored which factors were associated with five specific outcomes: initiating discussion about HS, recommending a CAM therapy, encouraging HS use for incurable cancer, providing chemotherapy concurrently with HS to > 20 patients in the past 12 months, and likely to combine chemotherapy with an unknown herb for treatment of patients with a curable cancer. Female sex (odds ratio [OR], 2.12; 95% CI, 1.06 to 4.24), higher self-reported knowledge (OR, 2.4; 95% CI, 1.2 to 4.9), prior education about HS (OR, 2.5; 95% CI, 1.3 to 4.9), correctly answering ≥ two knowledge questions (OR, 1.84; 95% CI, 1.01 to 3.36), and estimating a higher prevalence of HS use among patients (OR, 1.96; 95% CI, 1.04 to 3.7) were all significantly associated with initiating a discussion about HS. Practicing in a community setting with or without academic affiliation (OR, 2.5; 95% CI, 1.1 to 5.79 and OR, 1.85; 95% CI, 1.00 to 3.43, respectively) and self-reported lack of knowledge about HS (OR, 4.17; 95% CI, 2.27 to 7.69) were associated with encouraging herb use during treatment of an incurable cancer. Older age (OR, 2.14; 95% CI, 1.21 to 3.78), male sex (OR, 1.81; 95% CI, 1.02 to 3.23), and nonwhite race (OR, 2.22; 95% CI, 1.20 to 4.00) were all associated with providing chemotherapy to curable patients taking an unknown herb (Table 4). Results of the univariable analysis are summarized in Appendix Tables A1 and A2 (online only).

DISCUSSION

This national survey of US oncologists found that despite a high prevalence of HS use by patients with cancer, fewer than half of

Table 4. Multivariable Analysis of Specific Communication and Practice Patterns Regarding HS

Predictor	Initiates Discussion About HS Use (n = 265)		Often or Sometimes Recommends HS to Patients (n = 262)		Encourages Herb Use for Incurable Disease (n = 257)		Has Ever Administered Chemotherapy With HS in Last 12 Months to > 20 Patients (n = 275)		Very Likely to Combine Unknown Herb and Chemotherapy for Curable Patients (n = 278)	
	OR*†	95% CI	OR*†	95% CI	OR*	95% CI	OR*	95% CI	OR*	95% CI
Age (≥ 48 *v* < 48 years)	0.84	0.45 to 1.56	0.63	0.34 to 1.17	1.65	0.92 to 2.99	0.96	0.53 to 1.74	2.14	1.21 to 3.78
Sex (female *v* male)	2.12	1.06 to 4.24	0.55	0.30 to 1.02	0.61	0.34 to 1.09	0.51	0.26 to 0.98	0.55	0.31 to 0.98
Race (white *v* nonwhite)	0.63	0.31 to 1.28	0.83	0.41 to 1.69	1.26	0.66 to 2.42	0.54	0.25 to 1.15	0.45	0.25 to 0.83
Practice setting										
Community with academic affiliation *v* academic					2.53	1.10 to 5.79				
Community *v* academic					1.85	1.00 to 3.43				
Has enough knowledge to answer questions about CAM (yes *v* no)‡	2.37	1.16 to 4.85			0.24	0.13 to 0.44				
Prior education (yes *v* no)	2.54	1.32 to 4.89					2.27	1.26 to 4.08		
Correct knowledge of HS (yes *v* no)§	1.84	1.01 to 3.36								
Oncologists' estimate of patient HS use (≥ 40% *v* < 40%)	1.96	1.04 to 3.70	0.48	0.26 to 0.87			7.46	4.07 to 13.67		

Abbreviations: CAM, complementary and alternative medicine; HS, herbs and supplements; OR, odds ratio.
*Obtained from final logistic regression model selected using stepwise method.
†Sample included oncologists who have discussed HS with patients.
‡From Likert-scale type of statement: "I know enough to answer patients' questions about HS," where response of strongly agree or agree meant enough knowledge.
§Correct knowledge of what HS not to combine with cancer treatment was derived from four multiple-choice questions; yes was assigned if at least two questions were answered correctly.

oncologists are discussing the topic with their patients. This proportion is lower than that found by Rhodes et al,[17] who reported that 77.1% of a sample of primarily gynecologic oncologists routinely asked patients about CAM use. Another study among pediatric oncologists found that 50% asked open-ended questions about CAM use at least half the time and that the frequency of inquiry varied by the CAM modality in question.[18] Our lower proportion may reflect the fact that we focused specifically on the topic of HS rather than the broader category of CAM therapies. That being said, our relatively low level of discussion is consistent with other data indicating that ≥ 40% of patients using CAM do not disclose this to their oncologists.[19] A recent study of patients finishing radiation therapy found that only 12.1% of all patients surveyed had discussed the topic with their physician.[20] Our study also found that only one in four discussions that did take place were initiated by the oncologist, even though most oncologists had administered chemotherapy to at least one patient in the previous 12 months who was concurrently using HS.

Barriers to physician-patient communication about HS exist at multiple levels. One barrier is the fact that according to patient reports, many physicians never ask.[5,21,22] We found, as hypothesized, that physicians with less knowledge about HS were less likely to discuss HS with patients. Unfortunately, only one in three oncologists indicated they had enough knowledge to answer questions about HS—a finding similar to reports from studies in other countries.[23-26] As we hypothesized, oncologists' estimates about the prevalence of HS use by patients were generally lower than estimates from studies of patients with cancer themselves.[3,11,12] This decreased awareness of prevalence of HS use was also associated with a lower likelihood of initiating a discussion with patients about HS use. Educating medical oncologists about the high prevalence of HS use and about commonly used HS may help improve communication patterns.

Discussing HS use with patients could have several benefits. An Australian study of 381 adult patients with cancer found that patients reported higher levels of satisfaction with their clinical visit when they reported discussing HS.[22] Our study found that oncologists are much more likely to believe that discussing HS use strengthens physician-patient relationships than they are to believe it weakens those relationships. This is consistent with findings from a study conducted by Richardson et al.[5] In addition, studies have found users of CAM more broadly are significantly more likely to be suffering psychosocial distress, report poorer quality of life, have active coping behaviors (eg, information seeking), and prefer patient-centered decision making.[27-31] As such, physicians who communicate with patients about the use of HS may thereby gain greater understanding of their patients' experience of illness and strengthen physician-patient relationships.

Several factors were found to be associated with practice patterns regarding HS use with cancer treatment. Participants practicing in the community setting as well as having poor knowledge of HS were more likely to encourage the use of herbs for incurable cancer. This finding could indicate that oncologists in the community may generally be less informed about the topic of HS or that community oncologists are more willing to explore other treatment options for patients with a limited prognosis than those practicing in an academic environment. In contrast, combining chemotherapy with an unknown herb for curable patients was associated with older, nonwhite male oncologists. This practice pattern association is interesting, considering younger

female patients tend to use CAM therapies more than their counterparts.[32,33] These findings are hypothesis generating and limited, because the study was not designed to explore these specific areas.

Few studies have explored the prevalence of toxicities directly related to HS use during anticancer treatment. A pilot study by Engdal et al[34] found that among 136 herb-drug combinations, 47 different potential interactions were identified. However, data on potential interactions were lacking for nearly half of the herbs. In another study of drug interactions among patients with cancer, including over-the-counter medications, found that increasing use of over-the-counter drugs was associated with more identifiable potential drug interactions.[35] The clinical impact of the use of HS during anticancer therapy remains unclear, but the potential for harm does exist. For example, a study of antioxidant vitamins during radiation therapy for patients with head and neck cancer found a trend toward increased recurrence of cancer and second primary cancers.[36] Because definitive data are lacking about the impact of HS, we encourage medical oncologists to discuss with patients the potential risks and benefits of HS in combination with anticancer treatments. Clinical decisions will need to be personalized and incorporate patient goals of care as well as available data regarding the HS in question.

This study has limitations. We studied only members of ASCO who lived in the United States. The results were not adjusted for multiple comparisons; as such, statistically significant findings about which we did not have prior hypotheses should be considered provisional until confirmed in future studies. Our response rate was typical for physician surveys, but nonresponders may have differed from respondents in ways that bias our results. The initial mailings and e-mails indicated the survey was about the use of HS by patients with cancer, and this topic may have discouraged those with no interest in or negative opinions about the topic. Thus, this sample may overly represent those with more positive opinions about HS. Analysis of the online survey indicated that 5% of those who visited the link answered no questions, and another 1% completed less than half of the survey. This could indicate that a small percentage of nonresponders had limited interest in or knowledge about the topic of HS use by patients with cancer.

Notwithstanding these limitations, this study suggests that US oncologists generally report a lack of knowledge regarding HS and relatively infrequently discuss use of HS with their patients, even when a patient is receiving chemotherapy, and even when a patient's cancer is potentially curable. Given the high prevalence of HS use by patients and the potential for adverse interactions with some cancer treatments, future efforts should seek to improve oncologists' knowledge about HS. Such efforts may lead to more open discussions with patients about this important topic, thereby improving patient care.

AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

Disclosures provided by the authors are available with this article at www.jco.org.

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AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

National Survey of US Oncologists' Knowledge, Attitudes, and Practice Patterns Regarding Herb and Supplement Use by Patients With Cancer

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Appendix

Table A1. Univariable Analysis of Specific Communication and Practice Patterns Regarding HS Among Oncologists Who Have Discussed CAM With Patients

Predictor	Total (n = 376)		Initiates Discussion About HS Use: Yes (n = 261)		Initiates Discussion About HS Use: No (n = 113)			Often or Sometimes Recommends HS to Patients: Yes (n = 246)		Often or Sometimes Recommends HS to Patients: No (n = 121)		
	No.	%*	No.	%	No.	%	*P*†	No.	%	No.	%	*P*†
Age, years							.567					.088
< 48	131	35	93	71	38	29		105	81	25	19	
≥ 48	139	37	103	74	36	26		97	72	38	28	
Sex							.002					.468
Male	263	70	170	65	92	35		175	68	82	32	
Female	109	29	88	81	20	19		68	64	38	36	
Practice setting							.601					.086
Academic	156	41	112	72	44	28		110	73	40	27	
Community with academic affiliation	75	20	49	65	26	35		46	61	29	39	
Community	140	37	97	70	41	30		86	63	51	37	
Race							.011					.496
Nonwhite	284	76	207	73	76	27		189	68	88	32	
White	83	22	48	59	34	41		52	64	29	36	
Personal use of CAM							.010					.566
No	244	65	158	65	84	35		162	68	76	32	
Yes	132	35	103	78	29	22		84	65	45	35	
Involved in clinical trial enrollment							.024					.298
No	29	8	15	52	14	48		17	59	12	41	
Yes	341	91	243	72	96	28		226	68	106	32	
Has enough knowledge to answer questions about HS‡							.055					.960
No	238	63	158	66	80	34		156	67	78	33	
Yes	133	35	101	76	32	24		87	67	43	33	
Prior education							< .001					.459
No	214	57	128	60	84	40		141	68	65	32	
Yes	157	42	129	82	28	18		101	65	55	35	
Correct knowledge of HS§							< .001					.438
No	178	47	106	60	70	40		111	65	60	35	
Yes	194	52	153	79	41	21		132	69	60	31	
Oncologists' estimate of patient HS use, %							< .001					.149
< 40	216	57	136	63	79	37		147	70	63	30	
≥ 40	159	42	125	79	33	21		98	63	58	37	

Abbreviations: CAM, complementary and alternative medicine; HS, herbs and supplements.
*Percentages may not add up to 100% because of missing values.
†χ^2 test of association.
‡From Likert-scale type of statement: "I know enough to answer patients' questions about HS," where response of strongly agree or agree meant enough knowledge.
§Correct knowledge of what HS not to combine with cancer treatment was derived from four multiple-choice questions; yes was assigned if at least two questions were answered correctly.

Table A2. Univariable Analysis of Specific Communication and Practice Patterns Regarding HS Among All Oncologists

Predictor	Total (N = 392)		Encourages Herb Use for Incurable Disease: Yes (n = 220)		Encourages Herb Use for Incurable Disease: No (n = 143)			Has Ever Administered Chemotherapy With HS in Last 12 Months to > 20 Patients: Yes (n = 115)		Has Ever Administered Chemotherapy With HS in Last 12 Months to > 20 Patients: No (n = 269)			Very Likely to Combine Unknown Herb and Chemotherapy for Curable Patients: Yes (n = 284)		Very Likely to Combine Unknown Herb and Chemotherapy for Curable Patients: No (n = 105)		
	No.	%*	No.	%	No.	%	*P*†	No.	%	No.	%	*P*†	No.	%	No.	%	*P*†
Age, years							.135					.130					.002
< 48	135	34	69	54	58	46		37	28	95	72		87	64	48	36	
≥ 48	145	37	85	63	49	37		53	37	92	63		117	81	28	19	
Sex							.112					.362					.006
Male	277	71	167	63	97	37		86	32	186	68		213	77	64	23	
Female	111	28	53	54	45	46		29	27	79	73		70	63	41	37	
Practice setting							.003					.855					.849
Academic	160	41	75	51	73	49		45	29	111	71		116	73	44	28	
Community with academic affiliation	79	20	55	72	21	28		23	29	55	71		56	71	23	29	
Community	148	38	89	65	48	35		46	32	99	68		110	74	38	26	
Race							.610					.008					< .001
Nonwhite	292	74	163	60	108	40		97	34	189	66		229	78	63	22	
White	91	23	55	63	32	37		17	19	72	81		51	56	40	44	
Personal use of CAM							.477					.458					.124
No	258	66	146	59	100	41		72	29	179	71		194	75	63	25	
Yes	134	34	74	63	43	37		43	32	90	68		90	68	42	32	
Involved in clinical trial enrollment							.305					.088					.972
No	30	8	19	70	8	30		5	17	25	83		22	73	8	27	
Yes	356	91	201	60	132	40		110	32	238	68		260	73	96	27	
Has enough knowledge to answer questions about HS‡							< .001					.189					.572
No	249	64	159	69	70	31		68	28	176	72		184	74	64	26	
Yes	138	35	59	45	71	55		47	34	90	66		98	72	39	28	
Prior education							.610					< .001					.188
No	226	58	133	62	83	38		52	23	170	77		159	70	67	30	
Yes	161	41	86	59	60	41		63	40	94	60		123	76	38	24	
Correct knowledge of HS§							.041					.130					.844
No	186	47	114	66	58	34		48	27	133	73		137	74	49	26	
Yes	202	52	106	56	84	44		67	34	132	66		147	73	55	27	
Oncologists' estimate of patient HS use, %							.398					< .001					.289
< 40	230	59	124	59	87	41		30	13	196	87		161	71	66	29	
≥ 40	161	41	96	63	56	37		85	54	73	46		122	76	39	24	

Abbreviations: CAM, complementary and alternative medicine; HS, herbs and supplements.
*Percentages may not add up to 100% because of missing values.
†χ^2 test of association.
‡From Likert-scale type of statement: "I know enough to answer patients' questions about HS," where response of strongly agree or agree meant enough knowledge.
§Correct knowledge of what HS not to combine with cancer treatment was derived from four multiple-choice questions; yes was assigned if at least two questions were answered correctly.