


# Complementary and Alternative Medicine Online Learning Intervention for Oncology Healthcare Providers: A Mixed-Methods Study

Integrative Cancer Therapies  
Volume 21: 1–13  
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DOI: 10.1177/15347354221079280  
journals.sagepub.com/home/ict  


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## Abstract

**Introduction:** With the increased usage of complementary approaches in oncology comes the need for its integration into healthcare professional (HCP) education. The purpose of this single-arm, mixed-methods study was to examine the feasibility and benefits of a brief complementary and alternative medicine (CAM) learning intervention for improving HCP knowledge, attitudes, and practices regarding CAM use in cancer care, and explore the experiences of participating HCPs. **Methods:** HCPs from the Tom Baker Cancer Centre in Alberta, Canada, were invited to participate in 3 online interactive learning modules that reviewed: (1) basic CAM information, (2) HCP-patient CAM communication, and (3) evidence-based CAM decision support. The study survey consisted of attitude (n = 14), knowledge (n = 31), and practice (n = 31) items, administered at baseline and two-months post-intervention. Semi-structured interviews were conducted with a subset of participants. **Results:** Approximately 300 HCPs were invited to participate, of which 105 expressed interest in the study (35%), and 83 of them consented to participate (79%). The intervention completion rate was 73% (61/83 HCPs). There was a significant pre-post change in HCPs' attitudes and, to a lesser extent, knowledge and practices related to CAM (8/14 attitude items changed pre-post compared to 13/31 knowledge items and 5/31 practice items), in which more HCPs reported patients should be assisted in making complementary therapy (CT) decisions, exhibited greater knowledge about CAM, and more often engaged in a CAM-related clinical practice. Qualitative findings supported the beneficial effects of the modules, with HCPs describing themselves as being more likely to ask patients about their CAM use and referring them to credible CAM resources. Nonetheless, the majority did not feel adequately prepared to make recommendations about specific CTs, even after the intervention. **Conclusion:** The current study suggests that online CAM learning offers a feasible and potentially promising intervention for improving oncology HCP knowledge, attitudes, and practices regarding CAM, warranting further investigation. This study highlights a need for institutional resources to help HCPs fully integrate CT decision support into cancer patient care. A coordinated evidence-based CAM program at cancer centers may help ensure that all patients' CAM-related needs are properly attended to.

## Keywords

complementary therapies, cancer, integrative oncology, health care provider, online learning

Submitted August 10, 2021; revised January 18, 2022; accepted January 24, 2022

## Introduction

Due to improved detection and treatment, 63% of Canadians with cancer are projected to survive for 5 years or more after their initial diagnosis.<sup>1</sup> However, the long-term sequelae of the cancer experience can adversely affect individuals' quality of life.<sup>2–4</sup> Complementary and alternative medicine (CAM) aims to improve patient wellbeing through mitigating the burden of cancer symptoms and side-effects.<sup>5</sup> The term CAM has largely been replaced by

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the term complementary and integrative medicine (CIM), recognizing that most cancer patients use complementary therapies (CTs) in conjunction with conventional cancer treatments, not as alternative curative therapies. However, the term CAM will be used throughout this paper as it was still often used during the time the study was conducted and thus was the actual term used in the study, with the acknowledgment that CIM is currently the most commonly used term to describe the integration of CTs into conventional care. CAM is traditionally classified into 5 categories: (1) biological products (eg, dietary supplements, vitamins), (2) body-based (eg, massage, chiropractic), (3) mind-body based (eg, yoga, meditation, mindfulness-based interventions), (4) alternative medical system (eg, homeopathy, naturopathy), and (5) energy-based (eg, acupuncture, tai chi, qi gong).<sup>5</sup>

CAM use is very popular in oncology, with estimates ranging from 10% to 76% worldwide.<sup>6-11</sup> Despite these high levels of usage, evidence indicates that many patients do not consult oncology HCPs about their CAM use and thus do not receive adequate information to safely integrate CT into their cancer care, possibly due to a perceived lack of knowledge among oncology HCPs about CTs.<sup>12,13</sup> In a 2014 survey of 481 cancer patients and survivors at our centre in Alberta, Canada, most participants (65%) reported making decisions about CT use based on recommendations from friends and family, rather than HCPs.<sup>14</sup> In addition, 80% reported no HCP had spoken to them about CT, resulting in a lack of professional guidance about safety, efficacy, and effectiveness of CTs.<sup>14</sup> In the same study, 100 oncology HCPs were surveyed.<sup>14</sup> The majority (>80%) reported limited knowledge about the role of CT in cancer care or evidence to support its use.<sup>14</sup> Furthermore, 70% of HCPs did not feel prepared to monitor CT use in patients, and fewer than 9% reported being very capable of searching for evidence-based CT information.<sup>14</sup>

Hence, HCP education is important, as without adequate knowledge, HCPs are unlikely to engage in CAM discussions with cancer patients, potentially resulting in the underuse of CTs proven to be effective or, conversely, inappropriate use that may be harmful.<sup>6</sup> Online learning is one effective and practical medium to deliver continuing professional education for HCPs, allowing flexible and self-paced learning. Online learning can also be easily updated, which is important given the rapidly evolving evidence related to CAM and the provision of ongoing hospital-based CAM training for oncology HCPs.

The majority of HCPs do not receive adequate formal CAM education. Common misconceptions about CAM (eg, CAM is unscientific and no more than a placebo) may also be obstructive to its integration into conventional medicine. We anticipated that an online CAM learning intervention would benefit HCPs by addressing knowledge gaps and lessening negative attitudes surrounding CAM use. Our

stance motivating this study was that many CAM approaches could be beneficial when combined with conventional treatment for managing treatment-related symptoms and side-effects, and because CAM use is very common, HCPs should be informed and open to discussing CAM use with their patients in a non-judgmental, evidence-based manner. Drawing from our 2014 study showing 90% of HCPs working within our cancer centre reported interest in receiving further CAM education,<sup>14</sup> a brief online learning intervention was implemented in 2015. The purpose of this study was to examine the feasibility and potential benefits of online CAM learning modules for oncology HCPs. The study objectives were to:

- (i) determine whether it was feasible to implement online CAM learning modules for oncology HCPs;
- (ii) evaluate the effects of online CAM learning modules on the knowledge, attitudes, and practices of HCPs regarding CAM; and
- (iii) explore, through personal interviews, HCPs' perceptions of CAM and alternative therapy use in cancer care and experiences with the modules.

## Methods

### Study Design

A mixed-method, single-group design study was conducted in 2015 comprising pre-post assessments of knowledge, attitudes, and practices regarding CAM and qualitative interviews with a sub-sample of participating HCPs.

### Participants

Inclusion criteria were HCPs providing care to patients within Cancer Care Alberta in Calgary, Alberta, Canada. Potential participants were informed of the study and invited to participate through recruitment posters, presentations to HCPs, and email announcements sent to all clinical staff. Once an HCP had confirmed their interest, they were contacted by a research team member, who oriented them to the 3 online CAM learning modules (OLMs) and how to navigate them in order to maximize the learning experience. A purposively sampled subset of participants who completed the intervention was invited to participate in a semi-structured, one-to-one interview to provide an in-depth description of their experiences and more generally their thoughts on CAM and the need for additional supports. Purposive sampling was used in order to obtain as heterogeneous sample as possible, in order to capture a varied range of participants with regards to health profession. Electronic informed consent was obtained from all participants. Ethical approval was obtained in 2014 from the Health Research Ethics Board of Alberta Cancer Committee.

## Online Learning Modules

The 3 OLMs were developed based on a previous learning needs assessment survey study by the Complementary Medicine Education and Outcomes (CAMEO) program,<sup>15</sup> a collaborative research initiative of the University of British Columbia School of Nursing and British Columbia Cancer Agency. The themes of the OLMs were: (1) significance of CAM in cancer, including definitions of common CTs and potential benefits of CT in cancer care and survivorship; (2) communication about CAM in clinical settings, including barriers to CT counseling and strategies to facilitate HCP-patient communication and to collect information on CAM use from patients; and (3) methods to support patients in making informed decisions about CAM through finding and evaluating credible CT information (see Appendix A). Each module took about 60 minutes to complete. The content of the OLMs included instructional materials and videos, and optional activities (ie, case studies, question and answer sessions) that allowed HCPs to apply their learning.

## Measures

*Demographics:* Age, sex, health profession, and number of years working as a health professional and with an oncology population.

*Feasibility (objective 1):* A log was maintained containing information on the number of HCPs who were invited to the study, expressed interest, consented, completed all 3 OLMs, and completed all study questionnaires. Feasibility targets determined based on previous similar studies<sup>16-21</sup> of online educational interventions for HCPs within a hospital setting were: (1)  $\geq 30\%$  of those invited expressing interest in the study; (2)  $\geq 80\%$  of those expressing interest consenting; (3)  $\geq 75\%$  of those consenting completing all 3 modules; and (4)  $\geq 75\%$  of those consenting completing both pre- and post-intervention questionnaires.

*Quantitative data (objective 2):* Outcome measures included a questionnaire of HCP knowledge, attitudes, and clinical practices regarding CAM use in oncology. The questionnaire was developed by members of the CAMEO program<sup>15</sup> based on a review of the relevant literature, and evaluated for face and content validity by a panel of experts, including CAM experts, CAM and cancer researchers, and oncology nurses. The questionnaire included: (i) 14 items assessing attitudes toward CAM on a 6-point Likert scale ranging from strongly disagree to strongly agree; (ii) 6 knowledge questions with 31 items (True or False) related to acupuncture use, HCP-patient communication, reasons patients fail to disclose CAM use, HCPs' concerns about CAM use, and important considerations when helping patients make decisions about CT; and (iii) 5 practice questions with 31 items evaluating on a 5-point Likert scale (1 = Never, 5 = Always) how often in the past month

participants: assessed patients' use of CAM, discussed CAM use with patients, referred patients to professional CT resources, consulted with professional CT resources, and used credible resources to learn about CT.

*Qualitative data (objective 3):* The qualitative interview guide (see Appendix B) covered the following areas: perceptions of CAM and previous experience with patients discussing CAM use, perceived benefits of the OLMs, whether and how the OLMs had impacted their knowledge, attitudes, and clinical practice, and factors underlying HCP satisfaction and dissatisfaction with the OLMs. Participants were also provided the opportunity to raise any other points that they believed were relevant to the conversation.

## Data Collection

Consented participants received a secured web-link to complete the baseline study questionnaire prior to accessing the OLMs, and then again 2 month following OLMs' completion. Participants received a follow-up reminder e-mail after 2 weeks if they had not yet completed the questionnaire at post-intervention, in order to increase the response rate. Qualitative interviews were audio-recorded and conducted by a trained member of the research team, holding a minimum Bachelor of Psychology degree. Interview recordings were transcribed verbatim.

## Data Analysis

*Feasibility (objective 1):* Descriptive statistics were used to calculate: (1) the number of HCPs invited to participate as a proportion of those who contacted the study team and expressed interest in the study; (2) recruitment rate (the number of HCPs who expressed interest in the study compared with those who consented); (3) intervention completion rate (the number of consenting participants as a proportion of those who completed all 3 OLMs); and (4) questionnaire completion rate (the number of consenting participants as a proportion of those who completed the pre- and post-intervention questionnaires).

*Quantitative analyses (objective 2):* Data were analyzed using SPSS27 (IBM Corp. 2020). Univariate statistics were generated for all of the variables in the dataset. Non-parametric tests were used because all outcome variables were non-continuous. The Wilcoxon signed-rank test for paired ordinal data was used to determine whether changes in participants' responses on Likert scales (1-6 "strongly disagree" to "strongly agree" and 1-5 "never" to "always") were statistically significant. Differences between pre- and post-intervention across the True or False questions were examined using a McNemar's test, which is the non-parametric equivalent of the paired-samples *t*-test, but for dichotomous rather than continuous dependent variables.

*Qualitative analyses (objective 3):* This study used a general inductive approach to generate an interpretive description of HCPs' experiences. Data obtained from participants was summarized, organized, and analyzed using a thematic analysis approach.<sup>22</sup> Raw data was read several times. Patterns within and between the interview transcripts were identified and coded.<sup>22</sup> Themes and subthemes emerged through an iterative process of building and refining the coding structure.<sup>22</sup> Validity and trustworthiness were achieved through interrater reliability agreement evaluation.<sup>23</sup> Two researchers (MB and DO) trained in qualitative analysis independently analyzed the data, discussed and reconciled disagreements. Inter-coder reliability agreement among the 2 researchers was used to enhance the validity of the themes that emerged from the data. Researchers practiced self-reflexivity, which allowed them to be aware of their preconceived ideas about HCPs' perceptions of CAM and perceived benefits of the intervention, thereby reducing their influence on the results.

## Results

### Feasibility

Of approximately 300 HCPs who were invited to participate between January and June 2015, 105 (35%) contacted the study team and expressed interest in the study, of which 83 (79%) consented to participate. Of consenting HCPs, 73 (88%) completed pre- and post-intervention assessments, and most (n=61, 73%) completed all 3 OLMs. Participant characteristics are presented in Table 1.

### Quantitative Findings

Quantitative results are presented in Table 2. Data from all 73 HCPs were used, regardless of whether they completed all 3 OLMs. There was a significant pre-post change in HCPs' attitudes and, to a lesser extent, knowledge and practices related to CAM (8/14 attitude items changed pre-post compared to 13/31 knowledge items and 5/31 practice items). Participants had changes in attitude toward CAM after the intervention (eg, more HCPs reported patients should be assisted in making CT decisions and that CTs should be offered in clinical settings), exhibited greater knowledge about CAM (eg, acupuncture is a regulated health practice, there are evidence-based guidelines about CT use in conventional cancer care), and more often engaged in a CAM-related clinical practice (eg, recommending CT to patients, reviewing CT evidence for a patient).

### Qualitative Findings

Twelve HCPs (nurse [n=4], pharmacist [n=2], oncologist [n=3], radiation therapist [n=1], nutritionist [n=1], palliative care practitioner [n=1]) participated in the semi-structured

**Table 1.** Participant Characteristics.

Characteristics	Mean (SD) [range]
Age (years)	42 (11.3) [23-66]
Number of years working as a health professional	16.3 (11) [1-48]
Number of years working with an oncology population	10.8 (9.1) [1-40]
Sex	n (%)
Female	68 (82)
Male	15 (18)
Health profession	n (%)
Nurse	35 (42)
Medical doctor	6 (7)
Pharmacist	11 (13)
Radiation therapist	4 (5)
Dietitian	3 (3.5)
Palliative care practitioner	3 (3.5)
Other	14 (17)
Missing	7 (9)

(n=83).

interview after completing the OLMs. Six themes emerged from the analysis: (1) motives for learning about CAM; (2) experiences with the OLMs; (3) benefits of the OLMs; (4) concerns regarding CAM; (5) obstacles to discussing CAM use with patients; and (6) suggestions for CAM integration into practice. Themes are described in the following sections with representative quotes from participants. A summary of the themes and subthemes is presented in Table 3.

*Motives for learning about CAM.* The following subthemes emerged from the data describing the motives for learning about CAM: (1) personal interest; (2) to provide proper CT advice and guidance; and (3) to improve HCP-patient communication about CAM.

HCPs were interested to learn more about CAM therapies. As this nurse shared: ". . . I have a personal interest and even sought out complementary and alternative meds as an option, even in my bachelor's degree." (P8). They also felt that their knowledge was inadequate to respond to patients' inquiries and provide advice about the evidence regarding the benefits and safety of CTs: ". . . patients are always asking, so any information [we gain] especially evidence-based information is good information." (P7, nutritionist)

Participants explained that when they were uncertain of CT evidence or skeptical about CT use, patients were likely to become defensive. They believed that learning more about CAM could help them improve their communication skills in relation to CAM as a way to reduce this defensiveness. As 1 nurse explained:

*"I was really hoping to get out of it [the OLMs] was really talking to people who are on some complementary or*

**Table 2.** Changes in Outcome Measures.

Outcome	P value
<i>Attitudes (1-6 Likert Scale: 1 = Strongly disagree, 6 = Strongly agree)</i>	
All cancer patients should be asked about their use of CAM therapies.	.013*
CAM is a threat to public health.	.391
Knowledge about CAM is important to me as a health care provider.	.000**
CAM therapies represent a confused and ill-defined approach.	.021*
Cancer patients should be assisted in making CAM decisions by health care providers.	.061
CAM use should be documented in the cancer patient's health record.	.001**
CAM therapies should be subject to more scientific testing before they can be accepted by conventional health care providers.	.117
CAM therapies can be dangerous in that they may prevent patients from getting the appropriate conventional cancer treatment.	.959
I hope to have some CAM therapies available to cancer patients in my practice setting.	.030*
Health care providers should be able to advise cancer patients about the risks and benefits of commonly used CAM therapies.	.011*
Information about CAM practices should be included in health care providers' training programs.	.000**
Cancer care should integrate the best of conventional and CAM therapies.	.090
CAM includes ideas and methods from which conventional cancer care could benefit.	.074
A number of CAM therapies hold promise for treatment and care of cancer patients	.001**
<i>Knowledge (True or False Questions)</i>	
<i>Acupuncture use</i>	
Acupuncture is a type of energy therapy that arose from traditional Chinese medicine. (True)	.77
Acupuncture is a regulated health practice (True)	.003**
Acupuncture trials have failed to show that acupuncture is effective for chemotherapy-induced nausea and vomiting (False)	.001**
<i>Communication</i>	
Health care providers should ask patients about their CAM use at new patient appointments, when a patient's health condition changes, and when new conventional cancer treatments are recommended (True)	.99
Health care providers should ensure patients understand the aims and outcomes of their conventional medical treatment plan when making decisions about CAM. (True)	.83
Health care providers should use the term "CAM" or "complementary medicine" when asking patients about CAM (False)	.07
Health care providers should talk about CAM only when the issue is raised by patients (False)	.01*
<i>Some cancer patients fail to disclose their use of CAM to oncology health care providers because:</i>	
Patients believe that their health care provider will not approve (True)	.001**
The patient's health care providers do not ask about their CAM use (True)	.13
Patients do not have confidence in their health care provider's CAM knowledge (True)	.34
Some patients do not recognize the therapy that they are using as being CAM. (True)	.007**
Patients do not want to show disrespect to their health care provider by suggesting CAM therapies. (True)	.40
<i>Health care providers have concerns about the use of CAM in conventional cancer care because:</i>	
Patients may not use credible information sources in making treatment decisions (True)	.039*
Some CAM therapies may interact with conventional cancer treatments (True)	.99
Patients may delay or refuse conventional cancer treatments (True)	.019*
CAM use may impact the measurement of conventional treatment outcomes (ie, blood tests) (True)	.008**
The evidence shows CAM therapies do not work (False)	.21
<i>When helping a cancer patient to make decisions about CAM therapies, it is important a health care provider:</i>	
Determines what type of evidence the patient is using to make the decisions (True)	.83
Discusses how CAM may help the patient achieve their goals (True)	.52
Explains concerns about safety and risks, as well as benefits. (True)	.82
Ensures the patient knows about evidence-based alternatives that may be helpful to achieve the patient's goals. (True)	.66

(continued)

Table 2. (continued)

Outcome	P value
Ensures the patient knows that CAM therapies are not recommended in cancer care (False)	.67
Miscellaneous	
Energy therapies, such as therapeutic touch, reiki, and healing touch, aim to influence human energy fields to improve health (True)	.91
Whole medical systems, such as traditional Chinese medicine, Ayurvedic medicine and First Nations healing, use multiple modalities to achieve health and manage illness. (True)	.065
All natural health products available for sale in Canada have been evaluated for safety, effectiveness, and quality by Health Canada's Natural Health Product Directorate (True)	.001**
Health care providers and patients can report adverse effects of natural health products using Health Canada's MedEffect program (True)	.039*
Research into the use of mind-body therapies, such as meditation and visualization, has found measurable effects in studies involving cancer patients. (True)	.22
There are published evidence-based guidelines about the use of CAM in conventional cancer care. (True)	.011**
The cost of massage therapy is covered by all third-party medical insurance plans in Canada. (False)	.23
Mind-body therapies must be led by a registered therapist. (False)	.012*
People with cancer use CAM primarily to cure their disease (False)	.001**
<i>Current Practices (1-5 Likert Scale: 1 = Never, 5 = Always)</i>	
How often in the past month did you engage in the following activities?	
Ask cancer patients about their use of CAM	.949
Provide information to cancer patients about CAM	.060
Provide recommendations to cancer patients about using CAM	.025*
Review evidence on a CAM therapy for a cancer patient	.008**
Document cancer patients' use of CAM	.745
Monitor cancer patients' use of CAM	.373
Provide a CAM therapy	.907
How often in the past month did you discuss the following CAM issues with cancer patients?	
How to balance the risks and benefits of using CAM	.556
The potential interactions of specific CAM therapies with conventional cancer treatments	.279
How to use CAM safely during conventional cancer	.499
The level of evidence supporting specific CAM therapies	.036*
Where to get evidence-based information about CAM	.065
How often in the past month did you refer cancer patients to the following?	
Specific sources of information about CAM (eg, websites, books, pamphlets)	.057
A health professional for information about CAM	.480
A health professional for a CAM therapy (eg, meditation, relaxation program)	.264
Integrated health clinic	.811
The Complementary Medicine Education and Outcomes Research Program (CAMEO program)	.204
A CAM practitioner	.371
Their primary care provider (ie, family doctor) for care related to CAM	.776
How often in the past month did you consult with the following?	
A health professional about CAM	.103
A conventional health professional in the community about CAM	.307
The Complementary Medicine Education and Outcomes Program (CAMEO program)	.004**
A CAM practitioner about CAM in general	.118
A CAM practitioner about a patient's specific use of a particular CAM therapy	.773
How often in the past month have you used the following CAM information resources to learn about CAM?	
Online CAM specific database (eg, Natural Medicines Comprehensive database, Natural Standards)	.194
Online biomedical literature database (eg, PubMed, CINAHL)	.498
Health care journals	.333
Telephone information lines (eg, Canadian Cancer Society)	.845
Textbooks	.571
Canadian Cancer Society, "Complementary Therapies"	.844
The Complementary Medicine Education and Outcomes Program (CAMEO program)	.000**

\*P &lt; .05; \*\*P &lt; .01.

**Table 3.** Summary of Qualitative Results.

Themes	Subthemes	Quotes
Motives for learning about CAM	Personal interest	“ . . . I think just my personal interest. I would like to see more of an open attitude and understanding of complementary and alternative therapies with the mainstream medicine.” (P4, Oncologist)
	Help provide proper CT advice and guidance	“ . . . every time patients would come to us with information or they would be asking questions about what herbal supplements or I have heard of this program in the States or Mexico and often the response is, I don't have enough information or there is not enough studies done for me to really counsel you on this.” (P10, Nurse) “ . . . I was just interested in learning more and sometimes patients will ask you for feedback or information about particular things and it is kind of like well I don't actually know anything about that.” (P12, Nurse)
	Improve HCP–patient communication about CAM	“ . . . I'm just kind of trying to cross that bridge of like you know being able to share back and forth a little more information [about CT with patients].” (P11, Nurse) “ . . . There is definitely that defensive wall that comes up and just kind of learning how to open up that communication a little better” (P12, Nurse)
Experiences with the OLMs	Convenience	“ . . . I can go in when I had a few minutes and then go back to it later on.” (P9, Radiation Therapist)
	Easy flow of information	“I thought it was really good and well-paced.” (P12, Nurse)
	Repetitive, long, and non-interactive content	“At times I felt like there was a lot of content being given to me but not necessarily always being interactive with the content.” (P5, Palliative Care Practitioner) “I think it was for a staff too long.” (P8, Nurse) “ . . . I mean there is some overlap. You know there were parts that were repetitive a little.” (P3, Pharmacist)
	Technological issues	“I had some issues with module 2 and module 3 as far when I would click the next button.” (P5, Palliative Care Practitioner)
Benefits of the OLMs	Improved their general knowledge about CAM	“I enjoyed it. I thought there was good information, some of it was new information, some of it was solidifying what already knew. . . .” (P8, Nurse) “I really liked it overall. Yeah. It was a great kind of overview. It is good to have an introduction and kind of group them into categories and get a basic understanding [of CAM].” (P12, Nurse)
	Recognized the importance of addressing CAM use	“Since taking the course, I have been a little bit more conscientious of trying to ask the patient [about CAM use].” (P10, Nurse). “ . . . it was very interesting to learn about how patients are reluctant to talk to oncologists about it [CAM use].” (P1, Oncologist)
	Learned how to find credible evidence-based CT information	“If they [patients] ask me questions about that type of thing [CT] now I feel like I could give them these webpages.” (P9, Radiation Therapist) “ . . . just the resources. We can go to different specific sites and find information that is actually thoughtful and it is not something that is more in the anecdotal side or something that is done with I guess less scientific side.” (P5, Palliative Care Practitioner)
	Felt more confident talking to patients about CAM	“ . . . Hmm. Well despite you know we have always been told about herbal therapies and some of that may interfere with traditional therapies. But now that I see how they might interfere and just a better way of approaching patients about it, so that they don't feel so perhaps defensive if we were to bring up the topic or you know and also just knowing who we can redirect them to, their family physicians or their oncologists about whether they can do it or not, you know.” (P3, Pharmacist)
Concerns regarding CAM	Use of alternative therapies by patients to cure cancer	“There has been a couple of patients who have been quite adamant about rejecting mainstream treatment in favour of alternative care like these IV vitamin C treatments.” (P7, Nutritionist) “We were supposed to start him [a patient] on treatment and he decides to go back to China; there's some [alternative] treatment there” (P11, Nurse).
	Risk of interaction between CTs and conventional cancer treatments	“ . . . We just have to give them this big disclaimer of the risks to it, so our main concern is you know making sure it [natural health products] is safe for patient at that point and we have no evidence to tell them its effectiveness” (P2, Pharmacist)

(continued)

Table 3. (continued)

Themes	Subthemes	Quotes
Obstacles to discussing CAM use with patients	Cost of CTs	“. . . I guess just knowing that someone is not being misguided as we have seen with naturopaths, patients have been misguided down this path and the other thing is all these different therapies and options and the cost associated with it, our patients are under high financial strain already at this point.” (P2, Pharmacist)
	Limited knowledge about CTs and evidence to support their use	“I’m a little bit more open about it so if they want to come back and talk to me about it, we can. But I am still not comfortable saying you should do this. . . I am not comfortable prescribing it or recommending it at least with the information that I have. So I think it is very difficult because at the end of the day the answer is I don’t know and that is not a very concrete answer for patients” (P1, Oncologist) “I don’t have the time to read in depth into the complementary and I think if I suggested you know patient try this, try this, I would be doing disservice to them, because I don’t have full knowledge base.” (P11, Nurse)
	Insufficient time/busy HCPs	It is not necessarily something we get to in depth unless they bring it up or they are asking me about something in particular or that kind of thing so. . . Because you know I have less than 5 minutes to do a complete assessment of what is happening with them in a follow up visit and then the doctor has to come in so...” (P12, Nurse)
Suggestions for CAM integration into practice	Conflicting opinions among HCPs toward CT	“. . . there may be other radiation therapists who would feel comfortable to recommend or not recommend certain things but they are afraid that the radiation oncologist or the doctor is not going to be open to it.” (P9, Radiation Therapist)
	More CAM education and/or training for HCPs	“I wouldn’t mind having a little more training about some of the specific herbal remedies that are out there that a lot of patients like.” (P3, Pharmacist) “. . . perhaps a more advanced course would be a little bit more helpful for people to at least have some familiarity with what patients most commonly come up with those things they are interested in trying” (P4, Oncologist)
	Educational CAM materials for patients	“I think what would be nice in the long run and is again a work process, is to give them [patients] all the sheet on complementary medicine.” (P6, Oncologist) “I would be nice to have that, even in our teaching pamphlets, right. Like even something I said you know these are safe antioxidants and dose levels to use while you have treatment. . . It would be nice if the Tom Baker could almost create a sheet like on our website where, you know, if a patient is asking questions about vitamin D, right, go here” (P10, Nurse)
	In-house CAM counsel service or clinical program	“I think I would like to see an option for maybe people to be able to refer to an area or department for further services if these patients are very interested in things that they might be able to review.” (P7, Nutritionist) “I think a lot our healthcare professionals aren’t comfortable having that conversation. . . we currently have some resources, but we don’t have anything really quick and tangible here to say this is the ‘go to expert person’ that I’m going to call for CAM therapy questions.” (P8, Nurse)
	Easy access to evidence-based CAM information	“There is a lot of information there. Ideally it would be nice to know where to access this outside of the online training. It would be nice to find and have an easy way to do that.” (P1, Oncologist) “. . . for a staff it [CT information] needs to be tip-sheet, fact-based.” (P8, Nurse)

alternative treatments who. . . When you just start asking them what it is or what it is about, there is kind of a defensiveness about it.” (P12)

**Experiences with the OLMs.** As part of their experience with the OLMs, participants described the following subthemes: (1) convenience; (2) easy flow of information; (3) repetitive, long, and non-interactive content; and (4) technological issues. Participants perceived convenience as an integral aspect of their experience: “It [the OLMs] was something that I could go in and out of at my own time.” (P7,

nutritionist). The majority also reported that the OLMs exceeded their expectations in terms of ease to use and follow and time to completion: “The courses all kind of went together and progressed how they should and made sense to me.” (P10, nurse)

Other statements made by the participants indicated that their experiences were positive, describing the OLMs as well-paced, user friendly, with a reasonable length and good format. Interestingly, some HCPs held opposite views, indicating that the OLMs were too long, repetitive, and not very interactive, and some experienced technological issues:



*"I think the only thing at the beginning was I couldn't use it on a specific browser." (P1, oncologist)*

**Benefits of the OLMs.** Participants reported that the OLMs helped them: (1) improve their general knowledge about CAM; (2) recognize the importance of addressing CAM use; (3) find credible evidence-based CT information; and (4) feel more confident talking to patients about CAM. Improved knowledge about CAM, including benefits, safety, and regulations surrounding CT use, was the overarching and direct benefit of the OLMs reported by all of the HCPs. As this pharmacist stated:

*"... it taught me a bit about all the different types of therapies that are complementary out there and just the dangers in some of them and how some of them can be quite therapeutic without being a danger to the patients." (P3)*

Participants recognized the importance of addressing CAM use, given that patients don't necessarily want to talk about CAM and may be uncomfortable consulting HCPs. As this radiation therapist explained:

*"... I can see the importance more now of it in that you know how much more stuff there is out there and how likely it is that the patients are using the stuff without saying anything and so I think it would be good to have that discussion or that sort of review of what is actually happening, who is doing what." (P9)*

Additionally, HCPs expressed that the OLMs opened their eyes to the field of CAM research and the resources available. They learned how to find credible CT information, which they could return to for providing evidence-based advice regarding CT use or refer patients and families to for assistance in their decision making. One oncologist said: *"The best part was to learn about the CAMEO program and then I have actually given that information out already to a patient when they asked me." (P1)*

Another important benefit of the OLMs reported by most HCPs was feeling more confident in discussing CAM use with patients. As this palliative care practitioner shared:

*"It [the OLMs] has definitely improved just my confidence around being able to interact with patients, especially again having those opportunities to go back and look at those resources, and giving it back to them." (P5)*

**Concerns regarding CAM.** The concerns regarding CAM raised by HCPs were: (1) the use of alternative therapies by patients to cure cancer; (2) the risk of interaction between CTs and conventional cancer treatments; and (3) the cost of CTs. HCPs were particularly concerned about some patients using alternative therapies to treat cancer:

*"We have had patients who have gone to receive integrative cancer treatments in Mexico and received something*

*[alternative] where they are basically instilling viral infections into people or other infections, to bolster the immune system." (P4, oncologist)*

With regards to interactions, some HCPs described the potentially harmful impact of inappropriate CAM use, which could interfere with expected conventional treatment outcomes. As one oncologist shared: *"... I also always tell my patients that, yes, you are taking all these stuff [antioxidants] to boost your immune system, but it may be boosting cancer cells as well." (P6)*

Finally, some HCPs expressed concern about the cost of CTs, especially due to the lack of health insurance coverage: *"... I think the other issue that we have with complementary medicines is [the] out-of-pocket cost." (P1, oncologist)*

**Obstacles to discussing CAM use with patients.** Perceived obstacles to discussing CAM use with patients included: (1) limited knowledge about CTs and evidence to support their use; (2) insufficient time/busy HCPs; and (3) potentially conflicting opinions among HCPs toward CTs. Participants described the OLMs as a good starting point in advancing their knowledge, yet the majority still did not feel comfortable or knowledgeable enough to consider prescribing or recommending CTs, or counseling patients about CT use, even after completing the OLMs. As one oncologist explained:

*"I can't recommend it [CT] without understanding it... For example, acupuncture I already knew about it, but you know in terms of its safety while patients are getting chemo and their platelets are low, I don't know about that." (P1)*

HCPs attributed their perceived insufficient knowledge to CAM being a very broad field, which made it difficult to have in-depth knowledge about CTs. Some HCPs, however, made a distinction between different types of CTs and their level of comfort in recommending certain CTs. Natural health products were perceived as being particularly problematic compared to mind-body therapies. As this pharmacist explained:

*"I don't think that we are ever going to be one to promote specific natural products but promoting the other side of things, the meditation, the yoga; that would be something that would be more feasible." (P2)*

Further, HCPs described insufficient time as an obstacle to effective patient-HCP communication about CAM: *"I do not have enough time and that it is the major issue. I mean, if I am in a new patient clinic, I see 10 new patients in the morning... I briefly mention it [CAM use]." (P6, oncologist)*

HCPs also reported reluctance about addressing CAM use with patients due to potentially conflicting opinions

among HCPs toward CT, which could result in mixed messages to patients and confuse them. As one nurse shared:

*“...there is maybe one [physician] who is like they can't be on any antioxidants while they are on radiation therapy, and then there is another one who said it probably really doesn't matter.” (P12)*

**Suggestions for CT integration into practice.** Participants made suggestions to enhance integration of CTs into clinical practice, including: (1) more CAM education and/or training for HCPs; (2) educational CAM materials for patients; (3) in-house CAM counseling service or clinical program; and (4) easy access to evidence-based CAM information. Most HCPs believed that they required more CAM education to help them address patients' CT-related needs, even after completing the OLMs: *“...We need more knowledge and more skills if we are actually going to be able to provide the patients with what they need to know [about CAM].” (P9, radiation therapist)*

Some HCPs thought that CAM training should be mandatory across the cancer centre, and suggested having follow-up or ongoing CAM training to keep up-to-date. Another suggestion made by most HCPs was circulating CT information to patients through pamphlets, iPads, or posters. Further, HCPs expressed a need for an in-house CAM service or specialist to whom they could refer patients who need CT counseling, thereby providing more comprehensive cancer care. As this oncologist shared:

*“I think as an oncologist maybe or a lot of other healthcare professionals would feel, maybe a bit more comfortable saying, 'well, why don't you go and consult with this team', that is kind of like the pain care team or something like it” (P6).*

In addition, while the majority perceived the CAM resources available (eg, CAMEO website) to be helpful, some thought they could also benefit from ready access to more tangible and concrete CAM information, claiming this could help them offer clear and direct advice to patients about CT use. As one nurse explained:

*“It needs to be kind of quick and easy and, from a nursing practice point of view, we want something tangible. We don't want to be told 'oh yeah, well, this is a theory philosophy', okay, that is good for background, but the nurses when they are face-to-face with the patient and families want to know what do I need to ask you, how can we do this safely, what evidence is there and where can I really send you to look for more information now” (P8).*

## Discussion

The purpose of this study was to evaluate the feasibility and effect of a brief online CAM learning intervention for

oncology HCPs, and explore the qualitative experiences of participants. The data support the feasibility of online CAM learning modules as a method for broadening HCPs' knowledge, attitudes, and practices regarding CAM use in cancer care, as evidenced by 35% of those invited to participate contacting the study team and expressing interest in the study, meeting the study target of at least 30%. Similarly, the recruitment (79%), questionnaire completion (88%), and intervention completion (73%) rates were comparable to those reported in previous similar studies of online educational interventions for HCPs.<sup>16-21</sup> The majority of participants presented positive comments on the intervention and its online format, such as flexibility to choose when to complete the modules. Therefore, online CAM learning among oncology HCPs appears to be feasible and acceptable. Nonetheless, 22 of the 83 HCPs enrolled did not complete the 3 OLMs, indicating that some participants might have experienced barriers or lost interest. Congruent with previous online education research,<sup>24-26</sup> technical issues were reported, potentially resulting in early termination by some HCPs. Future efforts should seek to minimize technical problems and optimize the content and interactive nature of the CAM education delivered online to enhance the HCP experience.

The quantitative evaluation of the intervention demonstrated changes in HCPs' attitudes toward CAM (eg, more HCPs reported CTs should be offered in clinical settings), but fewer changes in CAM knowledge and engagement in CT-related clinical practice with patients (8/14 attitude items changed compared to 13/31 knowledge items and 5/31 practice items). This finding suggests that shifting HCPs' attitudes toward CAM may not proportionally or immediately result in knowledge improvement or practice change.

Both the quantitative and qualitative analyses suggested that after the intervention, HCPs gained knowledge about CAM, such as the evidence-based benefits of certain CTs and policies and regulations surrounding CT use in oncology. HCPs also exhibited significant improvements in important practice areas, such as confidence in reviewing and discussing the level of evidence supporting specific CTs with patients. These improvements in practice areas were consistent with the qualitative findings, which showed that HCPs felt more confident discussing CAM use with patients and referring them to credible CT resources. Nonetheless, it is important to recognize that the literature in many cases is insufficient to make clear recommendations regarding the safety and effectiveness of various CTs. In addition, accessing CAM literature outside openly published guidelines is not always possible since many CAM journals are not indexed by mainstream databases. Further, CAM literature may have problems with publication bias, and often has restricted access to articles. Finally, new therapies are always being introduced into the marketplace,

which patients may ask about. Often these therapies have not been systematically investigated, so keeping up with current trends can be difficult if not impossible for many HCPs.

Overall, given prior research showing that HCPs within Cancer Care Alberta perceive themselves to be unfamiliar with CAM therapies and that they would like to receive CAM education, we anticipated that participants would benefit from CAM learning modules. This expectation is consistent with our results, showing OLMs helped meet the HCPs' need to learn about CAM and reduce their discomfort when responding to patients' CAM inquiries. Despite this study not being designed to detect efficacy of the tested intervention, the findings provide early insight into benefits of online CAM learning modules, which included improving knowledge about CAM and helping HCPs integrate CT decision support into cancer patient care.

Notably, qualitative results indicated that after completing all 3 modules, many participants still felt that their knowledge was limited and reported a need for further and ongoing CAM education, and the majority were still cautious about suggesting a CT to their patients. This finding is not surprising, given that CAM is rarely included in conventional HCP training, and professional liability concerns may deter HCPs from making CT recommendations.<sup>27-29</sup> Numerous other challenges can also hinder CAM integration into daily HCP clinical practice. For example, the lack of cohesion of CAM practitioners within healthcare systems, several unstudied or understudied CTs, unrealistic patient expectations of CT benefits (eg, to cure cancer), and high cost of some CTs are all factors that can impede attempts to address the CAM-related needs of cancer patients. While improving HCP knowledge about CAM is crucial, a comprehensive and unifying approach is required to address these other issues through education, policy, and research.

A suggestion provided by HCPs during the interviews to address their knowledge gaps and to safely and effectively integrate CT into cancer patient care was having a hospital-based resource (eg, Integrative Oncology specialist or CT consult service or clinical program) to whom they could refer patients requiring personalized CT counseling. Such a resource could help ensure that all patients receive credible CT information and avoid potentially conflicting or inaccurate advice about CT. Additionally, some HCPs felt overwhelmed by the amount and variety of CT information available in the modules; therefore, they wanted access to simple, evidence-based CT guidelines that could be readily used in daily clinical practice, similar to how UpToDate is used in conventional clinical practice. Overall, our results confirm existing knowledge gaps among HCPs to address the CAM needs of their patients, which underscores the importance of more HCP training to assess and monitor CT use in addition to hospital-based CT resources and guidelines.

Participants in this study raised concerns regarding complementary and alternative medicine use in oncology, such as inappropriate use of natural health products or traveling to other countries to receive alternative therapies. These findings reinforce the necessity for patient education on both integrative and alternative modalities, as well as the importance of HCPs being able to support patients in making informed decisions relating to their cancer care and the efficacy and safety of various treatments. Future efforts should seek to establish a framework for the method and content of such communication as well as how to build trust and open conversations around CAM use, the benefits, and possible adverse effects. While HCPs may not feel comfortable recommending CTs, all should initiate conversations about CAM and provide patients with CT information alongside information on conventional treatments in order to avoid the potentially detrimental effects of undisclosed, inappropriate CAM use.

The study findings should be considered with the following research design considerations. First, this was a single-arm design; as such it is possible that effects may not be due to the intervention applied. Second, recruitment relied on self-selection. HCPs who held more positive views on CAM may have been more likely to contact the research team and consent to participate. However, if HCPs entering the study were already strongly in favor of CAM, we expect a ceiling effect would have resulted in no statistical change in attitudes. Third, the study was only conducted in one site whose organizational culture might affect the generalizability of the results. It is also important to note that while this study was conducted in 2015, there is no reason to suggest that the findings are no longer relevant. The study site still lacks systematic CAM training for oncology HCPs while CAM use among patients remains very high (75% according to a 2018 survey study in Alberta, Canada).<sup>6</sup>

A strength of this research was the use of a purposively selected subset of qualitative interview participants, resulting in a heterogeneous sample of HCPs, including, among others, oncologists (25%), pharmacists (16%), nurses (33%), radiation therapists (8%), and nutritionists (8%). This heterogeneity provided a richer and more representative understanding of the perceptions of oncology HCPs in relation to CAM and online CAM learning. The incorporation of both quantitative and qualitative findings also generated a greater understanding of online CAM learning on HCPs' knowledge, attitudes, and practices.

## Conclusion

The online CAM learning intervention tested in this study improved oncology HCPs' knowledge, attitudes, and practices regarding CAM, positioning them to be better able to attend to patients' CT information and decision support

needs. While many HCPs reported feeling more confident talking to patients about CAM after the intervention, the majority felt their knowledge about CAM was still lacking. Access to evidence-based institutional resources, such as guidelines or a CAM clinical program, were recommended by HCPs to further support their clinical practice related to CTs. CAM use is highly prevalent in oncology and HCPs have an integral role in providing evidence-based CT decision support. Future research that evaluates the efficacy and impact of CAM education and training is required.

## Appendix A

### Credible CAM resources

- Canadian Cancer Society (CCS), Complementary therapies (<https://cancer.ca/en/treatments/complementary-therapies/what-are-complementary-therapies>)
- Canadian Cancer Society (CCS) Cancer Information Helpline (<https://cancer.ca/en/living-with-cancer/how-we-can-help/talk-to-an-information-specialist>)
- Complementary Medicine Education and Outcomes Program (CAMEO)—CAM and cancer education program for patients and HCPs (<http://cameoprogram.org/patient-health-care-provider-resources/education-courses/>)
- Memorial Sloan Kettering Cancer Center—Herbs and Botanicals Database (<https://www.mskcc.org/cancer-care/diagnosis-treatment/symptom-management/integrative-medicine/herbs>)
- Natural Medicines (<https://naturalmedicines.therapeuticresearch.com/databases.aspx>)
- National Cancer Institute's Office of Cancer Complementary and Alternative Medicine (OCCAM) (<https://cam.cancer.gov/>)
- National Institutes of Complementary and Integrative Health (NCCIH) (<https://www.nccih.nih.gov/>)
- Society for Integrative Oncology (SIO)—Clinical practice guidelines (<https://integrativeonc.org/practice-guidelines>)

## Appendix B: Interview Questions

- What prompted you to enrol in this study?
- Can you tell me about previous incidences of patients wanting to discuss CAM with you?
- How did you find the online training?
- Can you explain if the program met your expectations?
  - If not, why not!
- Is CAM important to you as a HCP?
- What was your experience in the program like?
- Why did you choose to enrol?
  - Benefits and Limitations
- What was the most useful/important aspect of the program?
  - Do you feel your knowledge has improved?
  - Has your clinical practice changed followed the training? Please specify.

- Have you used the information in any discussions with patients? Was it helpful?
- Do you feel you are able to identify suitable resources for patients? How? What?
- Are there areas in discussing complementary therapy that you still require support with?
- Was there anything that was unnecessary or that you would remove?
- Would you recommend this online training program? Why? Why-not?
- Is there anything else you would like to add?

### Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.


### Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: LEC holds the Enbridge Research Chair in Psychosocial Oncology, cofounded by the Canadian Cancer Society Alberta/NWT Division and the Alberta Cancer Foundation, as well as a Canadian Institutes of Health Research Mentorship Chair in Innovative Clinical Trials. MB and DO are supported by the Training in Research and Clinical Trials in Integrative Oncology (TRACTION) fellowship from the University of Calgary. MB and GL are funded by a University of Calgary “Eyes High” Postdoctoral Fellowship. DO is supported by a joint Cumming School of Medicine-Charbonneau Cancer Institute Postdoctoral Fellowship.

### Human Welfare Statement

Informed consent was obtained from all participants. Ethical approval was obtained from the Health Research Ethics Board of Alberta Cancer Committee.

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