

# A pre-post evaluation of oncology healthcare providers' knowledge, attitudes, and practices following the implementation of a complementary medicine practice guideline

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## Research Article

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# Abstract

## PURPOSE

Complementary medicine (CM) use is prevalent among cancer patients, yet it is often not assessed by oncology healthcare providers (HCPs). The purpose of this study was to evaluate oncology HCPs' knowledge, attitudes, and practices surrounding CM use before and after the implementation of a practice guideline focusing on standardizing assessment and documentation of CM.

## METHODS

Oncology HCPs across a provincial cancer agency were invited to participate in the study. The implementation strategy included an initial education session for HCPs and standardized CM assessment forms. Pre-post surveys assessing knowledge, attitudes, and practices related to CM were completed by HCPs prior to attending the education session and following the 4-month implementation period. Paired t-tests were conducted to determine differences between baseline and follow-up surveys.

## RESULTS

A total of 31 oncology HCPs completed both baseline and follow-up surveys, with over 3,700 patient CM assessment forms being completed during the 4-month study period. At the end of the study, HCPs reported greater CM knowledge ( $p < 0.001$ ), readiness to support cancer patients' CM decisions ( $p = 0.002$ ), and willingness to consult with another HCP about CM ( $p = 0.004$ ). No significant change in HCPs' reported attitudes towards CM, or clinical practices related to CM were observed.

## CONCLUSION

Implementing a practice guideline, including a CM education session and a standardized assessment form was found to improve oncology HCPs' self-reported CM knowledge and readiness to answer cancer patients' questions about CM. The findings provide support for future knowledge translation research aimed at standardizing how CM is addressed within cancer care settings.

## Introduction

Complementary medicine (CM) is defined by the National Center for Complementary and Integrative Health as 'a group of diverse medical and health care systems, practices, and products that are not presently considered to be part of conventional medicine' [1]. It is estimated that up to 80% of individuals with cancer use CM [2, 3] and while some CM therapies are safe and effective [4], others may pose risks [5, 6]. For example, some natural products may induce allergic reactions, cause organ toxicities, and interact with cytotoxic agents [7–9].

Individuals with cancer have reported hesitancy in disclosing CM use to their oncology healthcare professionals (HCPs), especially if they are not asked about such therapies [10–12]. Up to 77% of cancer patients do not disclose their use CM to their HCP [13] and when CM use is discussed, individuals with cancer are often the ones to initiate the conversation [14–16]. Moreover, there is a disparity between reported CM disclosure and what is documented in patients' electronic medical record [17]. Reasons for non-disclosure may include a lack of rapport with HCPs, how questions about CM are framed, fears of medical scepticism, and concerns about damaging the patient-clinician relationship [11, 12].

While some oncology HCPs hold positive attitudes towards CM for managing symptoms and side effects [18, 19], improving quality of life [20], and increasing patient satisfaction with care [21], many report having inadequate knowledge to confidently discuss CM with patients [14, 21–25]. Other identified barriers for oncology HCPs discussing CM include inadequate training [24, 25], concerns regarding efficacy and safety [14, 25], organizational barriers to accessing CM information [21], lack of confidence in addressing questions about CM [18, 26], and the belief that consulting about CM is not their responsibility [27]. Despite these barriers, a growing cadre of oncology HCPs are recognizing the importance of addressing CM use among individuals with cancer and are seeking CM education and training opportunities [23, 24]. To overcome the barriers experienced by both individuals with cancer and oncology HCPs related to CM and to ensure safe and informed CM use, practice guidelines that standardize care related to CM are needed.

This current study was undertaken as part of the Complementary Medicine Education Outcomes (CAMEO) research program, a CM knowledge translation program that existed at British Columbia Cancer, a provincial cancer agency, from 2007–2013. During the CAMEO research program, it became apparent that there was a lack of standardization across cancer care settings with regards to how CM use was assessed and documented [12], and how patients were supported in making evidence-informed decisions about CM. To improve the quality of care related to CM use, we developed a clinical practice guideline for oncology HCPs [28]. The objective of this study was to implement key recommendations from the practice guideline and investigate the change in oncology HCPs' knowledge, attitudes, readiness, and clinical practices related to CM.

## Methods

### *Setting and study participants*

All full-time and part-time oncology HCPs employed at CancerCare Manitoba, the provincial cancer agency that provides care for all individuals with cancer in the province of Manitoba, were informed about the study via email. Formal recruitment occurred in-person, either individually or through group presentations, to those expressing interest about the study. This study was approved by the University of Manitoba Research Ethics Board and CancerCare Manitoba Research Resource Impact Committee. All HCPs provided informed consent prior to participating in the study.

### *Study Design*

A pre-post survey design was employed to examine the change in oncology HCPs' knowledge, attitudes, readiness, and clinical practices following the implementation of key recommendations from the clinical practice guideline over a 4-month time period (Fig. 1).

### *Implementation Strategy: Education Session and Standardized CM Assessment Form*

Pragmatically, and following consultation with leadership at the cancer agency, the implementation strategy focused on three main recommendations from the practice guideline; namely, assessment, documentation and education related to CM. Oncology HCPs who provided informed consent were encouraged to attend a 30-minute education session that was offered in person, through telehealth, or via a recorded online training video. The multi-format education session was created to accommodate the busy schedules of the HCPs. Each training session included information regarding: 1) what are CM therapies; 2) importance of assessing and documenting CM use in cancer care; 3) how to ask about CM use; 4) how CM use would be assessed and documented in a standardized manner; and 5) which individuals were eligible for CM assessment and documentation for the purposes of the study. A study package was provided that included a standardized CM assessment form, a copy of the education session's slides, and CM information resources, including the CAMEO Complementary and Alternative Medicine in Canada booklet (Manitoba version), and a CM pamphlet previously published by the Canadian Cancer Society. A "cheat sheet" that reminded HCPs how to assess for common CM therapies was also provided.

The standardized CM assessment form was a 1-page, double-sided hard copy form that was distributed across clinical settings in which consenting HCPs were located. The form listed 40 natural products, including dose and frequency of use, and 11 non-biological CM therapies and CM practitioners. HCPs were instructed to either complete the form together with individuals with cancer, or to allow patients to complete on their own. Completed CM assessment forms were then returned to the medical records department to be entered into the electronic chart. This pragmatic approach mirrored how medications and other patient-reported quality of care indicators are assessed and documented within the institution.

To encourage continued engagement and use of the CM assessment form throughout the implementation period, HCPs received weekly email reminders, along with evidence-based information resources for patients. Brief summaries of recent studies on CM therapies were also provided to HCPs (Supplementary Table 1) to increase awareness of CM research and posters were displayed in clinical areas to promote clinical discussions about CM use.

### *Instruments*

Before attending the education session and implementation the CM assessment form, HCPs completed a baseline survey, entitled the "CM Knowledge, Attitudes, and Practice Survey", which assessed their knowledge of CM, attitudes about CM, readiness to support individuals with cancer's decision to use CM and their current CM assessment and documentation practices. This survey has been used in previous

studies [12, 29, 30] and includes items drawn from other instruments that assess HCPs' knowledge, attitudes and practices related to CM [12, 31, 32]. The survey was comprised of four sub-scales:

1. *Knowledge* – This 8-item, 4-point Likert scale (1 = strongly agree to 4 = strongly disagree) assessed HCPs' knowledge regarding their familiarity with the CM decision-making process, the state of evidence for select CM therapies, credible sources of CM information, and the availability of CM education opportunities for HCPs. Following reverse coding, total knowledge score ranged from 8 (lowest knowledge) to 32 (highest knowledge) (Supplementary Table 2).
2. *Attitudes* – This 27-item, 4-point Likert scale (1 = strongly disagree to 4 = strongly agree), adapted from the Attitudes Towards Professional Practice of CAM Questionnaire [31], assessed HCPs' attitudes towards CM and conventional medical care. This scale was designed to assess changes in attitudes over time and was used to evaluate CM curriculum in medical schools. Specific items were reverse coded so that a higher score reflected more positive attitudes (Supplementary Table 2). Total attitude score ranged from 27 (most negative) to 108 (most positive).
3. *Readiness* – This 17-item, 4-point Likert scale (1 = strongly agree to 4 = strongly disagree) assessed HCPs' confidence in supporting patients with CM decisions, as well as their openness and readiness to work with, or refer patients, to CM practitioners. These items were drawn from the IM-30 survey, which was developed to assess clinicians' orientation towards integrative medicine [32]. Specific items were reverse coded so that a higher score reflected greater readiness to support patients' CM decision making (Supplementary Table 2). Total readiness score ranged from 17 (lowest readiness) to 68 (highest readiness).
4. *Practice* – This 26-item, 5-point Likert scale (1 = never to 5 = always) assessed HCPs' practice using the following subscales: i) assessment of CM use (1 item); ii) referrals to CM information sources, services, or practitioners (5 items; total score ranged from 5 to 25); iii) consult with another HCP about CM (4 items; total score ranged from 4 to 20); iv) engage in CM-related activities (5 items; total score ranged from 5 to 25); and v) discuss CM decision support (5 items; total score ranged from 5 to 25). This scale was derived from our previous research and informed by the IM-30 [32] (Supplementary Table 3).

In addition, to the CM Knowledge, Attitudes and Practice survey, HCPs also completed several demographic items, including age, self-identified gender, years of experience in oncology, and specialty area. Following the implementation period, HCPs were asked to complete a survey that was identical to the baseline survey.

### *Statistical Analysis*

Descriptive statistics summarized study participant characteristics. Missing data was replaced using the mode of the missing item across all participants. Out of the 73 items on the study questionnaire, only 10 participants had at least one missing value, with the maximum number of missing values being 5. Changes from baseline to follow-up on the study outcomes (total scores on the CM knowledge, attitudes, readiness and five clinical practices scales) were assessed using paired t-tests to determine mean

differences and 95% confidence intervals (CI). Sensitivity analyses were also conducted excluding participants who reported not attending the education session. Statistical significance was set at  $p \leq 0.05$ , and Bonferroni correction was employed to correct for multiple comparisons ( $p < 0.006$ ; 0.05 divided by eight comparisons).

## Results

A total of 82 HCPs expressed interest in the study and were formally approached to participate, with 44 providing informed consent and completing the baseline survey. Both baseline and follow-up surveys were received from 31 HCPs, for an overall response rate of 37.8% (Fig. 2). Of the 13 HCPs that withdrew from the study: four participants did not provide a reason; two participants left their role at the cancer agency; two said they lacked time; and five psychosocial oncology providers, on reflection, deemed the assessment of CM to not be within their scope of practice. Table 1 presents the characteristics of the participants who completed the study, which included 10 oncologists (32.3%), 13 nurses or nurse practitioners (41.9%), 2 pharmacists (6.5%), 4 radiation therapists (12.9%), and 2 dietitians (6.5%). The majority identified as female ( $n = 23$ ; 74.2%), with a median age of 42 years (range: 31–62) and a median of 10 years of experience in oncology. Close to 40% stated they had received CM education in the past and over half (51.6%) reported personally using CM. Only 11 HCPs (35.5%), however, indicated that they recommend CM to their patients.

### *Knowledge, Attitudes, and Readiness to Support CM Decisions*

Total CM knowledge score significantly improved by a mean difference of 4.23 (95% CI: 2.77, 5.69) from baseline to follow-up ( $p < 0.001$ ; Table 2). While attitudes toward CM became more positive from baseline to follow-up, this finding was not statistically significant (Table 2). Oncology HCPs' readiness to support patients' CM decisions, however, changed significantly from baseline to follow-up, with a mean difference readiness score of 3.03 (95% CI: 1.19, 4.88;  $p = 0.002$ ; Table 2).

### *Clinical Practices*

With regards to changes to clinical practices associated with CM, HCPs reported they were significantly more likely to consult with another HCPs about CM, especially with clinicians employed within their cancer agency (mean difference = 1.13; 95% CI: 0.39, 1.87;  $p = 0.004$ ; **Table 3**). HCPs also reported asking about CM use and making patient referrals to CM information resources more frequently, however, this change was not statistically significant (**Table 3**). No changes were observed in engagement in CM-related activities, including offering CM information or recommendation, reviewing evidence about CM therapies, monitoring patients' CM use, providing a CM therapy, or supporting patients in making informed decisions about CM (Table 3). Half of the HCPs reported that they would likely use the CM assessment form in the future; 30% were "not sure", and 20% said that they would not.

No changes were observed in the study findings when participants who did not attend the education session were excluded, with the exception that HCPs who took part in the education reported a significant

positive change in referring patients to CM resources (Supplementary Table 4).

## Discussion

The use of CM is becoming increasingly prevalent among individuals with cancer. As a growing number of patients and survivors integrate CM into their treatment plan, it is important that oncology HCPs standardize the assessment and documentation of CM use to promote safety and person-centred care. However, to prepare oncology HCPs to address CM use within their clinical practice, education as well as clinical guidelines and tools are required.

In our study, the implementation of key recommendations from a practice guideline regarding assessment, documentation and education related to CM was found to significantly improve oncology HCPs' self-reported knowledge about CM, their readiness to provide decision support related to CM, and their willingness to consult other HCPs about CM. Oncology HCPs' reported attitudes towards CM, and specific clinical practices, including asking individuals with cancer about CM use and making referrals to CM information resources, however, did not significantly change.

### *Knowledge and Readiness to Support CM Decisions*

The positive shift observed in oncology HCPs' reported knowledge of CM following participation in the education session and the application of a CM assessment form was similar to the findings of Delaney and Manley [33]. In this Australian study of 21 HCPs, comprised mainly of radiation therapists, CM knowledge and documentation of CM improved significantly following an education seminar and the introduction of a standardized CM screening tool [33]. Similarly, in a quasi-experimental study of a CM education intervention among 44 oncology nurses, an improvement in knowledge about CM was found; however, the day-long education session focused specifically on the efficacy and safety CM therapies versus assessing and documenting CM use [20]. Insufficient knowledge about CM is a significant barrier to HCPs' engagement with individuals with cancer about CM [14, 21, 24, 25, 34]; thus, it is imperative that CM education programs be offered in conjunction with the implementation of practice recommendations across the multidisciplinary oncology healthcare team. Our study, along with previous research [20, 33], suggests that tailored education sessions can improve reported knowledge about CM and potentially change HCPs' clinical practice related to CM.

Participants in our study also reported a significant improvement in their readiness to support individuals' CM decisions. This finding corroborates previous research that found oncology HCPs' readiness to speak to patients about CM and make referrals to a practitioner for CM information or care was enhanced following an education intervention [35]. Improving HCPs' comfort and confidence in addressing CM may be important, especially in light of previous studies that have found a lack of confidence to be a substantial barrier to patient-clinician communication about CM [14, 18, 25].

### *Attitudes towards CM*

In previous cross-sectional and qualitative studies, oncology HCPs have expressed variable attitudes towards CM; this ranges from being quite negative and dismissive of CM use [36] to being open and receptive to the potential role of CM in cancer care [37–39]. In our study, oncology HCPs' attitudes towards CM were invariant, which has been previously found [20, 33], and may be a result of multiple factors. Foremost, participants who took part in our study may have had more positive views of CM, with the average total attitude score at baseline being 80.3 out of 108, and over half reporting personal use of CM. Thus, the lack of change observed may be reflective of a ceiling effect and the pre-existing positive attitudes held by HCPs towards CM. Moreover, there is a growing recognition among oncology HCPs of the potential role of select CM therapies in improving patients' quality of life, managing cancer- and treatment-related symptoms and side effects, and enhancing overall satisfaction with care [18–22, 24, 34]. CM use among individuals with cancer, however, continues to be a contentious matter in some practice settings [40] and negative attitudes towards CM can hinder clinical discussions and disclosure of CM use. The provision of CM education to oncology HCPs that addresses their concerns about CM is imperative to promote non-judgemental consultations about CM.

### *Practices related to CM Use*

With regards to oncology HCPs' clinical practices, we found limited change in how often HCPs asked individuals about their use of CM, provided CM decision support, made referrals to CM resources, and engaged in other clinical activities related to CM. A significant difference, however, was observed in the reported frequency of consultations with another HCP about CM, as well as referrals to CM resources, specifically by HCPs who attended the education session. This result may have been a consequence of the emphasis placed in the education session on the value of consulting other oncology HCPs, such as pharmacists and dietitians, and utilizing available information resources regarding the safety and efficacy of CM use.

Previous studies on oncology HCPs' clinical practices related to CM have reported more substantial changes to practice behaviours. Delaney and Manley reported a significant proportion of HCPs continued to use a CM screening tool 6 months following completion of an education intervention [33]. As well, Hessig *et al.* reported oncology nurses as being more likely to recommend specific CM therapies to individuals with cancer following an 8-hour education session [20]. The lack of self-reported practice change observed in our study may have been a consequence of the brief nature of the education intervention (i.e., 30 minutes) and potential reporting biases, as well as how the CM assessment form was implemented in clinical practice. Although over 3,700 assessment forms were completed over the 4-month implementation period, the lack of change in HCPs' self-reported practices may reflect the fact that some clinics chose to disseminate the assessment form to patients directly, limiting discussions about CM between patients and their HCPs. It is also possible that organizational barriers, such as workload or lack of role clarity regarding CM [21], may have prevented some HCPs from changing their practice. Further, given the nature of oncology healthcare teams, some HCPs may have not perceived themselves to have the autonomy to proactively address individuals' CM use [41]. In the future, the use of objective measures of HCPs' practice behaviour may provide a more accurate representation of clinical practices

related to CM. Moreover, the implementation of a CM practice guideline may require a more intensive education program and institutional policies that inform clinical practice.

### *Strengths and Limitations*

This study has several strengths. There was participation across the interdisciplinary oncology healthcare team and treatment areas, with engagement from oncologists, nurses, pharmacists, and other allied health professionals. The brief education intervention was readily accessible to oncology HCPs through in-person sessions, telehealth, and via YouTube. Also, where possible, standardized and psychometrically valid instruments were used to evaluate the study outcomes. Moreover, over 3,700 CM assessment forms were completed, demonstrating the feasibility of assessing CM use within cancer care settings.

Several potential limitations should be considered. This study involved a sample of 31 oncology HCPs from one province in Canada and, therefore, may not be adequately powered to detect changes in self-reported practices. In addition, 30% of the initial sample of 44 consenting HCPs did not complete a follow-up questionnaire for various reasons. Considering this, the study findings may not be generalizable to all oncology HCPs as those who participated in the study may have been more interested or open to CM than those HCPs who chose not to participate, or did not complete the follow-up survey. As well, we did not assess if the observed self-reported changes resulted in a meaningful difference in clinical practice and patient care. In addition, the persistence of the changes observed in this study following the implementation of the practice guideline recommendations is uncertain. Further, while the flexibility in how the CM assessment form was completed (i.e., clinical assessment vs. patient self-report) may have been pragmatic for the uptake in a busy oncology setting, it may have limited HCPs' practice change and opportunities for dialogue between individuals with cancer and HCPs about CM use.

## **Conclusion**

Practice guidelines are commonly not evaluated; in this study, the implementation of clinical recommendations focused on assessment, documentation and education improved oncology HCPs' reported knowledge, readiness to address CM use, and willingness to consult with other HCPs about CM. Future research utilizing rigorous methodologies, such as large randomized controlled trials, is needed to more reliably assess how the implementation of practice recommendations affect oncology HCPs' knowledge, attitudes and clinical practices related to CM. In addition, research evaluating the full scope of the clinical practice guideline, which includes the provision of CM decision support, is required to ensure individuals with cancer are supported in making safe, evidence-informed decisions about CM. As individuals with cancer continue to seek and use CM as part of their care trajectory, it is imperative that oncology HCPs address CM use as part of their standard clinical practice.

## **Declarations**

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**CONFLICTS OF INTEREST/COMPETING INTEREST:** All authors disclose they have no conflicts of interest to disclose.

**AVAILABILITY OF DATA:** Data is stored on a University of Manitoba private server and can be made available upon request.

**CODE AVAILABILITY (software application or custom code):** All analyses were conducted using Stata 15.1, and code can be made available upon request.

**AUTHOR'S CONTRIBUTIONS:** Conceptualization: LGB conceptualized the study. Methodology: All authors contributed to formal analysis and investigation. CZW entered, cleaned, and analysed the data. Writing: All authors wrote, reviewed, edited, and approved the final version of the manuscript. Funding acquisition: LGB secured funding for the study. Supervision: LGB and CZW provided supervision for the study.

**ETHICS APPROVAL:** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study was approved by the University of Manitoba Health Research Ethics Board (HS17924/ H2014:417) and the CancerCare Manitoba Research Resource Impact Committee (RRIC # 2017-36).

**CONSENT TO PARTICIPATE:** All participants provided informed consent at recruitment of the study.

**CONSENT FOR PUBLICATION:** Participants consented to have non-identifying information published.

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## Tables

Table 1  
Demographics of study participants who completed the  
study

Characteristics of participants (N = 31)	N (%)
Gender	
Man	8 (25.8%)
Woman	23 (74.2%)
Age – Median (range)	42 (31–62)
Type of Health Care Provider	
Oncologist (Medical, Radiation)	10 (32.3%)
Nurse or Nurse Practitioner	13 (41.9%)
Pharmacist	2 (6.5%)
Radiation Therapist	4 (12.9%)
Dietitian	2 (6.5%)
Years in Oncology – Median (Range)	10 (1–33)
Years in clinical practice – Median (Range)	11 (2–38)
Hours worked	
Full-time	27 (87.1%)
Part-time	4 (12.9%)
Recommended CM to patients	11 (35.5%)
Used CM in personal life	16 (51.6%)
Received CM education in past	12 (38.7%)
Participated in CM education session	25 (76.7%)

Numbers represent N (%) unless otherwise indicated

Abbreviations: CM, Complementary and integrative medicine

Table 2

Baseline and follow-up survey results for oncology healthcare providers' CM knowledge, attitudes, and readiness (N = 31)

Total Scores	Baseline	Follow-up	Mean Difference (95% CI)	P value*
	Mean (95% CI)	Mean (95% CI)		Baseline vs. follow-up
Total knowledge score	18.71 (17.46, 19.96)	22.94 (21.40, 24.47)	4.23 (2.77, 5.69)	< 0.001**
Total attitude score	80.32 (77.12, 83.52)	81.60 (78.10, 85.10)	1.27 (-0.67, 3.23)	0.193
Total readiness score	38.29 (35.81, 40.76)	41.32 (39.15, 43.49)	3.03 (1.19, 4.88)	0.002**

\* P-values represent test for difference between baseline and follow-up survey using paired t-tests

\*\* Significant value after Bonferroni correction ( $p < 0.006$ )

Abbreviations: CI, confidence interval; CM, Complementary medicine

Table 3

Baseline and post intervention survey for oncology healthcare providers' CM clinical practices (N = 31)

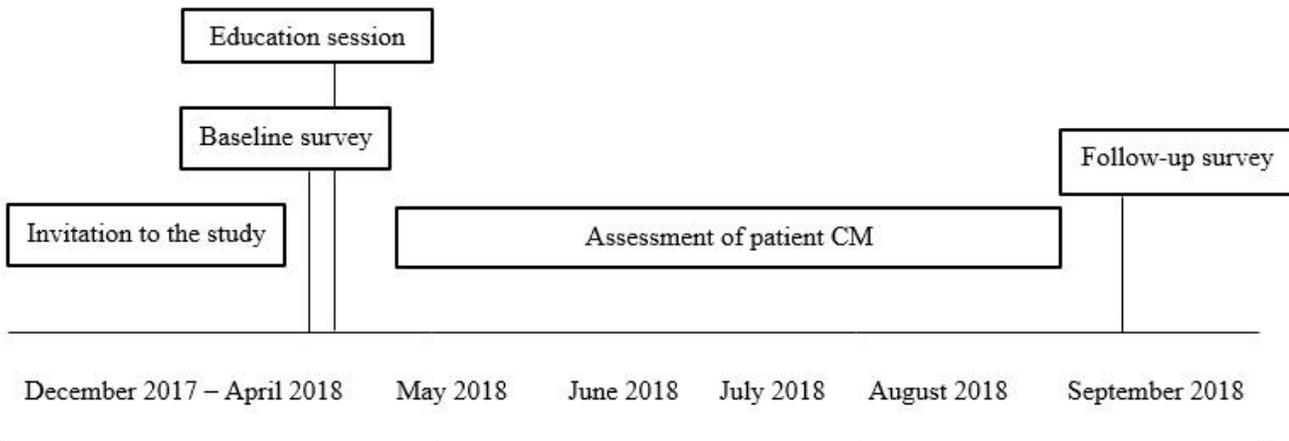
	Baseline	Follow-up	Mean Difference (95% CI)	P value*
Clinical Practices	Mean (95% CI)	Mean (95% CI)		Baseline vs. follow-up
Ask about CM	3.74 (3.39, 4.10)	3.90 (3.61, 4.19)	0.16 (-0.14, 0.46)	0.282
Refer to CM resources	12.64 (11.10, 14.19)	14.26 (13.06, 15.46)	1.61 (0.28, 2.94)	0.019
Consult with another HCP about CM	7.26 (6.31, 8.20)	8.39 (7.58, 9.19)	1.13 (0.38, 1.87)	0.004**
Engage in CM-related activities	11.71 (10.61, 12.81)	12.87 (11.77, 13.97)	1.16 (0.10, 2.23)	0.03
Provide CM decision support	15.23 (13.85, 16.60)	16.00 (14.52, 17.48)	0.77 (-0.22, 1.77)	0.121

\* P-values represent test for difference between baseline and follow-up survey using paired t-tests

\*\* Significant value after Bonferroni correction ( $p < 0.006$ )

Abbreviations: CI, confidence interval; CM, Complementary medicine; HCP, Health care provider

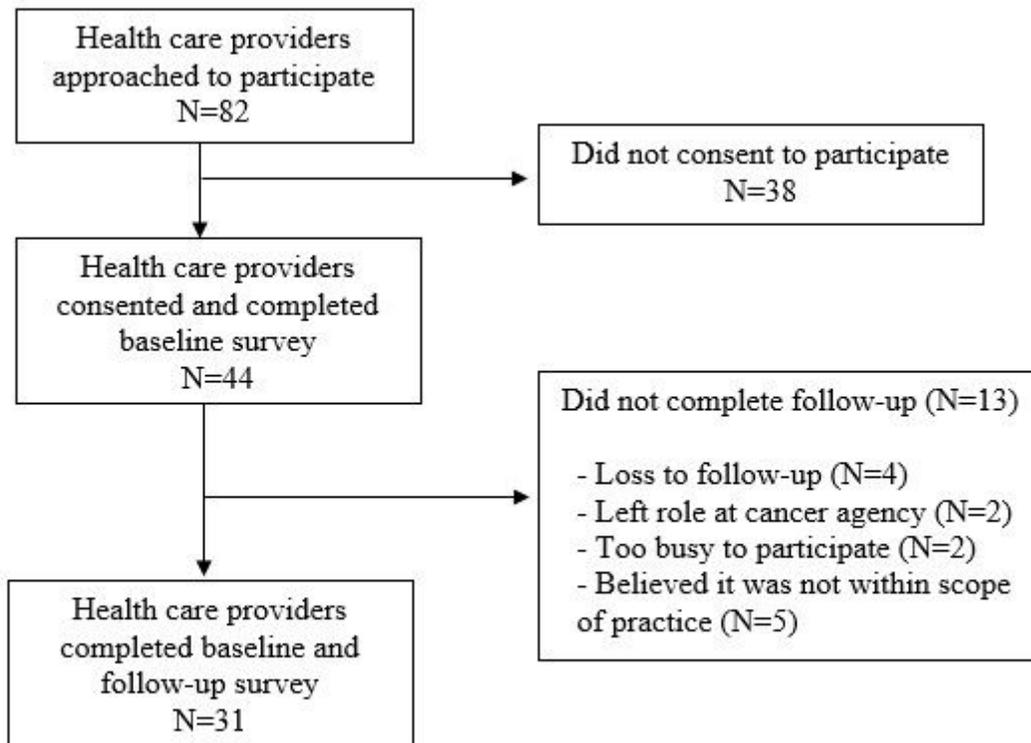
## Figures



Abbreviations: CM, complementary medicine

**Figure 1**

Timeline of study



**Figure 2**

Participant flow diagram of those included in study

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [SupplementaryMaterial.pdf](#)