Advancing Supportive Cancer Care: A Survey of Naturopathic Doctors to Identify Practice Patterns, Knowledge Gaps and Resource Needs

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ABSTRACT

Background: Clinical guidance for naturopathic doctors (NDs) in supportive cancer care is limited, highlighting a potential need for resource development.

Objectives: Describe naturopathic practice, identify oncology-related knowledge gaps, and determine preferred clinical resources.

Methods: A 40-item online survey was distributed to NDs through naturopathic associations, social media, and informal networking. Questions varied based on whether respondents provided cancer care ("cancer stream") or not ("general stream"). The survey ran from September 2023 to March 2024. Data analysis included frequency distributions and descriptive statistics.

Results: Among 149 eligible responses, 62% practiced in Canada, 36% in the United States, and 2% elsewhere. The cancer stream (n = 99) primarily worked in community settings, offered hybrid care, and did not exclusively treat cancer patients. The largest knowledge gaps were related to intravenous (IV) green tea extract and curcumin, photodynamic and ozone therapy, managing tinnitus, and interactions between naturopathic interventions and stem cell transplants and photodynamic therapy. Time constraints were the main barrier to addressing knowledge gaps. The smallest gaps were reported for exercise counselling, the Mediterranean diet, IV vitamin C, vitamin/mineral infusions, and managing constipation, anxiety, diarrhea, fatigue, hot flashes, and depression. In total, 97% supported the development of clinical resources, with no format preference. In the general stream, 58% indicated that additional training would increase their likelihood of offering cancer care.

Conclusion: This survey highlights oncology-related knowledge gaps, which were generally highest for less commonly used and studied therapies, and strong clinician support for resource development. Varied resource formats may accommodate different learning styles and improve dissemination.

Key Words Supportive cancer care, naturopathic research, clinical practice survey, integrative oncology, naturopathic medicine, naturopathic oncology

INTRODUCTION

Naturopathic medicine is one of the most commonly used traditional, complementary and integrative medicine (TCIM) systems in the Western world.[1] Naturopathic doctors (NDs) use interventions such as natural health products (NHPs), nutrition counselling, lifestyle and behaviour changes, and acupuncture to treat disease and support health.[2] Studies suggest use of naturopathic medicine is higher among those with cancer.[1] The use of TCIM therapies, including naturopathic medicine, for those with cancer is referred to as "integrative oncology," defined as "a patient-centred, evidence-informed field of cancer care that utilizes mind and body practices, natural products, and/or lifestyle modifications from different traditions alongside conventional cancer treatments."[3]

As the term "oncology" is a protected medical term in some jurisdictions, this paper will refer to the practice of NDs in integrative oncology as "naturopathic cancer support" or "naturopathic cancer care." The goals of naturopathic cancer care include educating patients on adopting healthy lifestyles, managing side effects, improving response to conventional treatments, reducing risk of recurrence, and optimizing overall health.[4]

Formal training and clinical guidance, such as clinical practice guidelines (CPGs), in naturopathic cancer care are limited. In 2019, the Oncology Association of Naturopathic Physicians (OncANP) published principles of care guidelines on patient-centred naturopathic care for those with cancer.[4] This guideline is an excellent initial step to support NDs in providing safe and effective care, but it does not provide specific therapeutic guidance. To

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date, five CPGs on integrative therapies have been created, one each for breast cancer, pain management, anxiety and depression, and cancer-related fatigue, and one on the use of cannabis and cannabinoids in adults with cancer.[5-9] Despite the advent of CPGs, many gaps remain, as the existing guidance only addresses a fraction of conditions and concerns faced by those with cancer, and also focuses broadly on integrative cancer care, rather than exclusively on naturopathic management.

Limited formal training opportunities exist for NDs interested in supportive cancer care. A handful of residency programs are available, and the American Board of Naturopathic Oncology offers a fellowship (FABNO) to support the advanced training of NDs. Criteria to receive FABNO designation include a 2-year residency in naturopathic oncology or 5 years' experience with 2,250 oncology patient contact hours, as well as submitting case reports and acquiring continuing education credits on cancer-related topics and passing the board certification exam.[10] According to the ABNO database, as of September 2024, 127 NDs across North America have their FABNO designation. The limited formal training may, in part, contribute to the lack of recognized specializations in naturopathic medicine. Identifying clinician-determined knowledge gaps is the first step to addressing them.

In this work, we distributed a survey with three objectives: 1) describe the type and extent of care provided by NDs; 2) characterize knowledge gaps of NDs who provide naturopathic cancer care; and 3) determine how NDs prefer to receive educational resources related to cancer care. Our overarching goal is to enhance naturopathic cancer care by facilitating the creation of clinical resources for NDs and other integrative healthcare providers (HCPs) who work with patients with cancer.

METHODS

This manuscript adheres to the Checklist for Reporting Results of Internet E-Surveys (CHERRIES).[11]

Survey Development and Design

SurveyMonkey was used for survey development and distribution and data collection. The survey contained an introductory page with a description of the survey, informed consent, and criteria for participation, followed by four distinct sections (parts A through D). Prior to distribution, the survey was pilot tested by three NDs not involved in its development. Feedback was provided on content and average completion time. Part A gathered demographic and clinical practice information and part B included questions related to knowledge translation and preferences for clinical resources. Respondents were then asked if they provide care to patients with cancer. This was the only mandatory question in the survey and it divided respondents into two streams: the "cancer stream" and the "general stream." The cancer stream included part C, with questions about cancer-focused clinical practice, and part D, on knowledge gaps related to naturopathic cancer support. A wide variety of question types were used, including multiple choice, checkboxes, dropdowns, matrices, Likert scales, and open text fields. Respondents were able to go back and review or change their answers using a "previous" button. Responses pertaining to knowledge gaps were collected using a Likert scale of 0–3 (no gap, minor gap, moderate gap, and major gap) with an option to select "not applicable" if the ND did not work with or recommend the item in question. Respondents in the general steam did not complete parts C or D and were instead asked about their interest in providing cancer support, as well as perceived barriers to providing cancer care. The survey included 40 items across 6 pages (screens): 19 for both streams, 18 exclusively for the cancer stream, and 3 exclusively for the general stream. The average number of questions per section (i.e., per screen) was 6.6. See Appendix A, Part 1: Survey Questions, for the full survey details.

Participants and Setting

This was an open survey distributed to NDs electronically, via naturopathic associations, social media, and informal networking. Respondents were eligible to complete the survey if they had graduated from a program accredited by the Council on Naturopathic Medical Education and were currently practicing naturopathic medicine. Distribution primarily took place through advertisements in national, provincial, territorial, state, and cancer-specific naturopathic associations across Canada and the United States. In total, 16 associations distributed the survey to their membership, including the Canadian Association of Naturopathic Doctors, the American Association of Naturopathic Physicians, and the Oncology Association of Naturopathic Physicians. The survey was available from August 29, 2023 to March 1, 2024. All respondents who completed the survey had the option of providing their email address to receive up to CA$150 as a matched amount by the company Vitazan to put towards the purchase of any NHPs from the Vitazan Professional line. The primary coordinating centre was the Patterson Institute for Integrative Oncology Research, a research division of the Canadian College of Naturopathic Medicine (CCNM), with staff and research associates located in Ottawa, Toronto, and Halifax, Canada.

Regulatory Adherence

Ethics approval was obtained by the Research Ethics Board of CCNM prior to distributing the survey. All respondents were required to read an introductory page which outlined eligibility criteria and informed consent prior to answering any questions. Data from Survey Monkey was transferred to a secure server managed by CCNM. Only those involved in the project had access to the data.

Outcomes

The objectives of this survey were to:

1. Describe the type and extent of cancer care provided by NDs
2. Describe cancer-related knowledge gaps reported by NDs working in cancer care
3. Determine the way NDs would like to receive educational tools and clinical resources related to naturopathic cancer care

Data Presentation and Analysis

Analyses included all respondents who completed the survey. Partial responses and responses of ineligible respondents were excluded. Descriptive statistics and frequency distributions were the main methods of analysis. If respondents were asked to give a response on a Likert scale, each option was given a numeric value from 0 to 3, with mean scores calculated accordingly. *P* values in the supplemental materials were calculated using the Chi-square test. Any data not explicitly reported in the manuscript is presented in Appendix A, Part 2: Supplementary Tables.

Patients and Public Involvement

Patients and the public were not involved in the design or conduct of this study, the collection or interpretation of the data, or the dissemination of this research.

RESULTS

Respondent Characteristics

In total, 170 responses were collected. Nineteen incomplete responses were removed, and two respondents indicated they were students and thus did not meet inclusion criteria, leaving 149 responses eligible for analysis. The view rate and number of unique site visitors for the survey were not calculated due to feasibility. Calculating an exact response rate is not possible given that respondents could have received the survey from multiple sources; however, it is estimated that there are 3,000 practicing NDs in Canada[12] and 6,000 in the United States,[13] with 75% (6,750) being members of provincial, state, or national organizations. Using this entire pool of potential respondents as the estimated denominator, our response rate was 2.2%. All questions had a ≥ 95% response rate. IP addresses were cross-referenced to search for duplicate entries. None were found.

Of the 149 respondents, 105 (71%) identified as women and 113 (76%) were 45 years of age or older. Ninety-nine respondents (66%) were in the cancer stream, and 50 (34%) were in the general stream. Of the 39 respondents who identified as men, 31 (79%) provided supportive cancer care. A greater percentage of NDs from the cancer stream had higher levels of education (i.e., a master's or PhD) compared with the general stream (29% vs. 4%, respectively). The majority of respondents (60%) had graduated from CCNM, and 48% had attended the Toronto campus. A full list of respondent demographics is presented in Table 1, and additional academic and professional qualifications are provided in Appendix A, Table S1.

TABLE 1 Respondent Demographics

Item	General Stream *n* (%)	Cancer Stream *n* (%)	Total *N* (%)
Gender (prefer not to answer n = 2)			
Man	7 (14)	32 (32)	39 (27)
Woman	41 (84)	64 (65)	105 (71)
Non-binary	0	1 (1)	1 (1)
Self-described	1 (2)	1 (1)	2 (1)
Age (years)			
< 30	6 (12)	7 (7)	13 (9)
30–44	2 (4)	21 (21)	23 (15)
45–59	24 (48)	33 (33)	57 (38)
≥ 60	18 (36)	38 (38)	56 (38)
Graduating school			
Bastyr University	4 (8)	19 (19)	23 (15)
Bridgeport University	0	3 (3)	3 (2)
CCNM: Boucher	11 (22)	7 (7)	18 (12)
CCNM: Toronto	31 (62)	40 (40)	71 (48)
National University of Health Sciences	1 (2)	1 (1)	2 (1)
National University of Natural Medicine	3 (6)	24 (24)	27 (18)
Sonoran University of Health Sciences	0	5 (5)	5 (3)

n (general) = 50; *n* (cancer) = 99; *N* (total) = 149.
CCNM: Canadian College of Naturopathic Medicine.

General Clinical Practice

Part A of the survey, general clinical practice, was completed by all respondents. Ninety-two respondents (62%) practiced in Canada, 54 (36%) practiced in the United States, and 3 (2%) practiced outside North America. Responses came from 6 provinces and 19 states; however, the overwhelming majority were from Ontario (36%) and British Columbia (17%). No other province or state contributed more than 6% of respondents. Despite a larger number of responses from NDs practicing in Canada, 46 out of 54 (85%) respondents from the United States provided supportive cancer care compared with only 50 out of 92 (54%) from Canada. Data suggests that respondents in the cancer stream had more clinical experience than those in the general stream, with 35% vs. 10% of NDs having ≥ 20 years of clinical experience, and 21% vs. 38% with < 5 years' experience. Almost all respondents provided one-on-one consultations; however, 31 (21%) also offered live group programming and/or pre-recorded material. Eighty-seven percent of NDs offered both in-person and virtual consultations. Practice settings were relatively evenly distributed between sole practitioner, multi-ND practice, and multidisciplinary practice (43%, 34%, and 38%, respectively). Only four NDs (3%), all from the cancer stream, practiced in a hospital setting. Table 2 presents information on Part A. Any information on general clinical practice not found in Table 2 can be found in Appendix A, Tables S2 and S3.

Cancer Stream, Clinical Practice

Part C of the survey gathered information on the cancer-related practice of the 99 NDs in the cancer stream (Tables 3 and 4). Of these respondents, 50% practiced in Canada and 46% practiced in the United States. Sixty-two percent of respondents reported ≤ 50% of their practice was related to cancer care. Sixty-seven percent of respondents reported they were a member of a cancer-specific organization, such as the OncANP, and 25% had a

TABLE 2 General Clinical Practice

Item	General Stream *n* (%)	Cancer Stream *n* (%)	Total *N* (%)
Country of practice			
Canada	42 (84)	50 (50)	92 (62)
United States	8 (16)	46 (46)	54 (36)
Other	0	3 (3)	3 (2)
Years in practice			
< 5	19 (38)	21 (21)	40 (27)
5–9	11 (22)	16 (16)	27 (18)
10–19	15 (30)	27 (27)	42 (28)
≥ 20	5 (10)	35 (35)	40 (27)
Method of care delivery (multiple selections allowed)			
One-on-one visits	49 (98)	98 (99)	147 (99)
Live group programming	6 (12)	14 (14)	20 (13)
Pre-recorded material	8 (16)	10 (10)	18 (12)
Membership programs	3 (6)	2 (2)	5 (3)
Time in patient visits (hours per week)			
< 10	9 (18)	10 (10)	19 (13)
10–29	35 (70)	62 (63)	97 (65)
≥ 30	6 (12)	27 (27)	33 (22)
Practice setting (multiple selections allowed)			
Community – sole practitioner	25 (50)	39 (39)	64 (43)
Community – multi-ND practice	16 (32)	34 (34)	50 (34)
Community – multidisciplinary practice	20 (40)	36 (36)	56 (38)
Hospital	0	4 (4)	4 (3)

n (general) = 50; *n* (cancer) = 99; *N* (total) = 149.

TABLE 3 Cancer Stream, Clinical Practice

Item	N (%)
Percent of practice related to cancer care	
1–25	42 (42)
26–50	20 (20)
51–75	9 (9)
76–100	28 (28)
Oncology fellowship	
FABNO	25 (25)
Type of cancer care (multiple selections allowed)	
Primary prevention	83 (84)
Secondary prevention	91 (92)
During active conventional treatment	90 (91)
After conventional treatment	95 (96)
Having declined conventional treatment	62 (63)
End-of-life care	48 (48)
Ability to perform qualified acts[1] (multiple selections allowed)	
Prescribe select pharmaceutical medications	65 (66)
Perform acupuncture	55 (56)
Administer intravenous infusion therapy	59 (60)
Perform injections[2]	73 (74)

N = 99.
[1] These acts require additional training and/or certification and may not be permitted depending on the province or state of practice.
[2] Excludes intravenous therapy (i.e., subcutaneous, intramuscular, intradermal).
FABNO = American Board of Naturopathic Oncology Fellowship.

FABNO designation. Across the cancer care continuum, almost all NDs worked with primary prevention, secondary prevention, and during active conventional treatment; however, only 48% offered end-of-life care, and only 63% offered care to patients who had declined conventional therapy. Ninety-one percent had additional education and/or training to be able to perform qualified acts such as acupuncture, parenteral therapy, and/or prescribing medications. Sixty-three percent of respondents indicated they communicate with conventional medical providers once per month or less. Any information about cancer-related clinical practice not found in Table 3 can be found in Appendix A, Tables S4 and S5.

Table 4 reports how frequently NDs in the cancer stream recommend various naturopathic interventions or refer out for them. General nutrition counselling, nutritional supplements, and herbal medicine were recommended most often, with ≥ 87% of NDs frequently offering these treatments. Intravenous (IV) infusion therapy use was the most variable, with 45% of NDs frequently recommending it and 23% never recommending it. The least used therapies were ozone therapy, low-level laser therapy, and photodynamic therapy, with more than 75% of NDs reporting that they rarely or never use these treatments.

The majority of NDs (61%) provide care to children or adolescents; however, only 4% selected that they "frequently" provide care to this population (Appendix A, Table S6). NDs provide care to people with breast cancer most often, with 82% reporting that they see these patients frequently (Appendix A, Table S7). Sarcomas were seen least often, with 65% reporting that they rarely or never see patients with these cancers.

Cancer-Related Knowledge Gaps

Part D of the survey gathered information about perceived knowledge gaps by NDs providing supportive cancer care (Figures 1–3). Notably, respondents could select "not applicable" if they did not provide care to patients receiving the therapy in question, did not manage a particular symptom or side effect, or if the intervention was not in their scope of practice. This option was included to protect the validity of responses, by removing those for whom the knowledge area is not relevant.

In general, NDs reported relatively minimal knowledge gaps related to interactions between naturopathic interventions and surgery, hormonal therapy, chemotherapy, or radiation therapy (no gap or minor gap: 80%, 74%, 71%, and 70%, respectively) (Figure 1). NDs reported a moderate or major gap most often regarding interactions between naturopathic interventions and monoclonal antibodies (49%), oral targeted therapies (53%), stem cell transplant (68%), and photodynamic therapy (71%).

Regarding knowledge gaps related to managing cancer and treatment-related symptoms and side effects (Figure 2), the greatest knowledge gaps were reported for tinnitus, palmar plantar erythrodysesthesia, and sexual dysfunction. Of the 32 symptom

TABLE 4 Cancer Stream, Use or Recommendations of Naturopathic Interventions

Intervention	Frequently (3)	Occasionally (2)	Rarely (1)	Never (0)	Mean Score (/3)	*N* (Reponses)
Nutrition counselling – general	94 (95%)	4 (4%)	1 (1%)	0	2.9	99
Nutritional supplements	93 (94%)	4 (4%)	2 (1%)	0	2.9	99
Herbal medicine	87 (88%)	9 (9%)	3 (3%)	0	2.8	99
Nutrition counselling – specific diets	77 (78%)	16 (16%)	5 (5%)	1 (1%)	2.7	99
Probiotics	67 (68%)	21 (21%)	10 (10%)	1 (1%)	2.6	99
Mind–body therapies	71 (72%)	12 (12%)	13 (13%)	3 (3%)	2.5	99
Exercise counselling	65 (66%)	25 (26%)	4 (4%)	4 (4%)	2.5	98
Mental health counselling	62 (63%)	23 (23%)	11 (11%)	2 (2%)	2.5	98
Acupuncture or TCM	46 (46%)	34 (34%)	14 (14%)	5 (5%)	2.2	99
Non-IV injections	48 (48%)	20 (20%)	19 (19%)	12 (12%)	2.1	99
Body-based therapies	42 (42%)	33 (33%)	18 (18%)	6 (6%)	2.1	99
OTC medications	39 (39%)	29 (29%)	24 (24%)	7 (7%)	2.0	99
Hydrotherapy	29 (29%)	37 (37%)	26 (26%)	7 (7%)	1.9	99
IVIT	43 (45%)	15 (16%)	15 (16%)	22 (23%)	1.8	95
Homeopathic remedies	31 (32%)	28 (29%)	21 (21%)	18 (18%)	1.7	98
Cannabis	21 (21%)	40 (40%)	24 (24%)	14 (14%)	1.7	99
Prescription medications	19 (19%)	28 (29%)	20 (20%)	31 (32%)	1.4	98
Hyperbaric oxygen	13 (13%)	24 (24%)	32 (32%)	30 (30%)	1.2	99
LRHT	12 (12%)	15 (15%)	35 (35%)	37 (37%)	1.0	99
WBHT	9 (9%)	19 (19%)	30 (31%)	40 (41%)	1.0	98
Ozone therapy	11 (11%)	12 (12%)	23 (23%)	53 (54%)	0.8	99
LLLT	9 (9%)	14 (14%)	26 (26%)	50 (51%)	0.8	99
Photodynamic therapy	7 (7%)	4 (4%)	19 (19%)	69 (70%)	0.5	99

Participants were asked to consider how frequently they recommend these therapies or refer out for them for patients with cancer.
IV: Intravenous; IVIT: Intravenous infusion therapy; LLLT: Low-level laser therapy; LRHT: Locoregional hyperthermia; OTC: Over the counter; TCM: Traditional Chinese Medicine; WBHT: Whole body hyperthermia.

prompts, NDs reported a minor gap or less on average for 23 items (72%). None of the respondents reported a major gap for managing appetite loss, hot flashes, anxiety or constipation.

Lastly, cancer stream respondents were asked about knowledge gaps related to the use of naturopathic interventions for people with cancer (Figure 3). NHPs had the lowest average knowledge gap of any treatment modality, with almost all NDs reporting no gap or a minor gap. The only outlier was homeopathic remedies, of which 41% reported a moderate or major gap. Epigallocatechin gallate (EGCG) infusions had the largest knowledge gap by far, with a mean score of 2.1 out of 3.0. This was the only treatment with a moderate to major gap on average. Respondents' knowledge of IV infusions varied greatly, with some therapies (e.g., vitamin/mineral infusion, IV vitamin C) having almost no gaps and others (e.g., EGCG, curcumin) having moderate or major gaps on average. NDs also tended to have higher knowledge gaps for treatments which required the use of medical equipment, additional training, or were outside their scope of practice, such as ozone therapy, locoregional hyperthermia (LRHT), and hyperbaric oxygen therapy.

When asked about reasons why NDs perceived they had these knowledge gaps, the most common responses were a lack of time to find and examine new data (68%) and a lack of formal training (47%). A lower percentage of NDs cited a lack of resources (39%), an inability to critically appraise available data (39%), and an inability to find data and resources (28%). For a complete tabular description of all knowledge gaps, see Appendix A, Table S8.

Knowledge Gaps and Clinical Practice

Across all categories, there were 44 items for which a moderate or major knowledge gap was reported by ≥ 20% of respondents. For 38 of these items (86%), NDs for whom supportive cancer care accounted for only ≤ 25% of their clinical practice reported moderate or major knowledge gaps more often than those whose practice was > 25% cancer-focused. Statistical significance ($p < 0.05$) was reached for 16 of these items (36%). A complete table is present in Appendix A, Table S9.

Knowledge Dissemination and Resource Creation

Directly accessing information through peer-reviewed journals or publication databases was by far the most common way NDs described gathering information, with 143 respondents (96%) frequently or occasionally using these items. Lay resources (e.g., magazines, Google) were used least often, with 49 respondents (33%) indicating they frequently or occasionally use these items. When asked which resources NDs would prefer to use, there was no clear preference. Approximately 80% or more indicated they would "like" or "love" to receive information through clinical

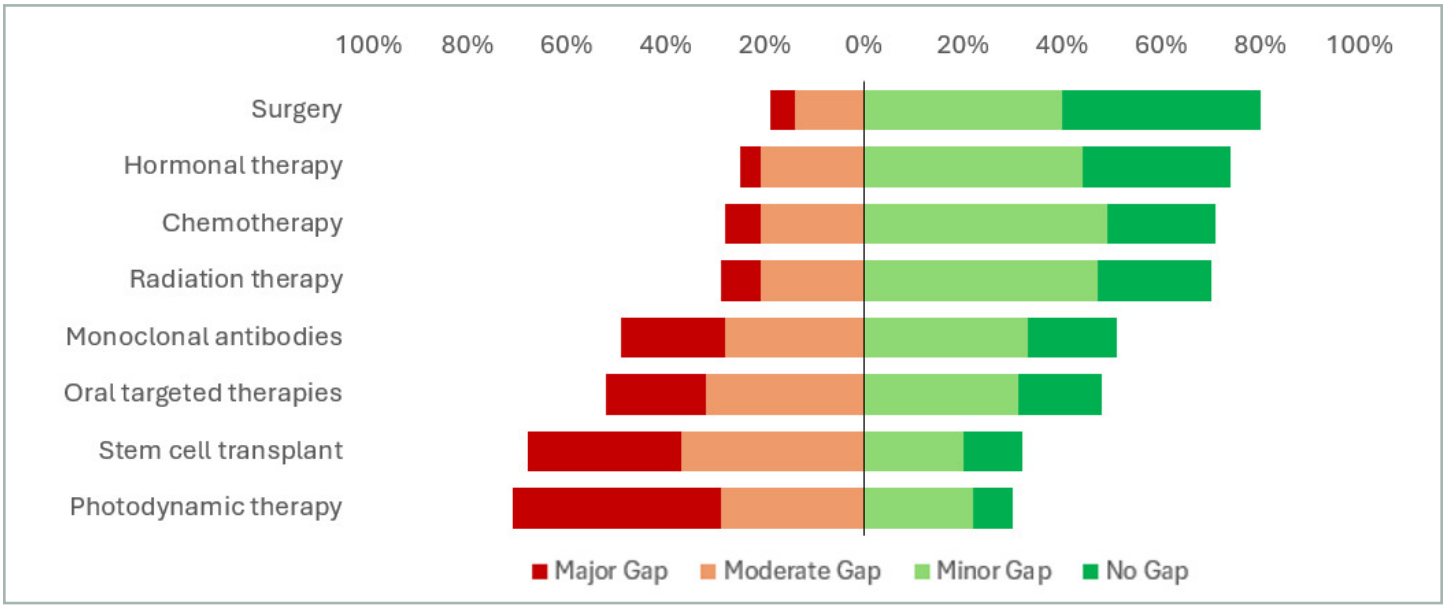

FIGURE 1 Knowledge Gaps Related to Interactions Between Naturopathic and Conventional Treatments. Percentage refers to the percentage of respondents who provided an answer. Respondents were instructed not to answer if they did not provide care to patients receiving the treatment listed. See Appendix A, Table S8, for number of respondents.

decision aids, professional monographs, conference presentations, webinars, clinical practice guidelines, courses, or fellowship programs. Appendix A, Tables S10 and S11 report on how NDs access information and the types of resources they would prefer to use, respectively.

Of the respondents in the general stream, 23 (46%) indicated they were interested in developing skills to support people with cancer, 11 (22%) were not interested, and 16 (32%) were unsure. Excluding those who were not interested, 31 (79%) respondents reported they don't work with cancer populations because of a lack of knowledge or training, and 29 (74%) indicated that the availability of better training and resources would increase their likelihood of providing naturopathic cancer support. More information regarding the interest of the general stream in providing cancer care is presented in Appendix A, Table S12.

DISCUSSION

To our knowledge, this is the first published survey reporting on the clinical practice and knowledge gaps of NDs providing supportive cancer care. Our results demonstrate that NDs provide a wide range of therapeutics to patients with cancer and are generally confident in their scope of practice; however, there are some areas where knowledge gaps exist that could be lessened through the creation of clinical resources and decision support tools.

Type and Extent of Care Provided by NDs

A high percentage of NDs (71%) who completed the survey identified as women, which is consistent with what has previously been reported for the profession.[14] Most NDs (76%) were aged 45 and older, which is inconsistent with surveys and reports in Canada showing that NDs are generally younger, with 59% aged 40 and under.[14,15] A much higher proportion of US respondents provided supportive cancer care compared with Canadian respondents (84% vs. 54%, respectively). Although seemingly disproportionate, this is likely because 69% of US responses came from members of the OncANP, a naturopathic oncology association with a high proportion of its members based in the United States. Thirty-three percent of respondents who provide supportive cancer care are not members of any cancer-focused organization. This may be explained by the fact that 88% of respondents in this group reported they provide supportive cancer care to only 1–25% of their patient base. Thus, respondents who see a small proportion of cancer in their practice are less likely to be members of oncology associations.

Regarding the clinical practice of both streams, there was a distinct absence of NDs in hospital settings. Almost all NDs practiced in the community, with nearly even splits between practice in multidisciplinary clinics, in clinics with multiple NDs, and as sole practitioners. Increasing in-hospital access to naturopathic care may be an important step to integrating holistic approaches with mainstream care.[16] Broadening the format of care NDs provide may also help increase patient access to naturopathic medicine. Most NDs surveyed (77%) only offer one-on-one patient visits, with only 14% providing live group programs, 10% pre-recorded programs, and 2% membership-based support. Given the expense of one-on-one naturopathic medicine,[17] lower-cost services such as group and pre-recorded programs may help remove financial barriers to supportive care and increase access to health information.

For the majority of cancer stream respondents (62%), less than half of their practice is focused on cancer care, indicating that few respondents have a clinical focus in cancer support. NDs see patients with thoracic and skin cancers far less often relative to their incidence rates.[18] This is much more pronounced for thoracic cancers; only 20% of respondents reported they "frequently"

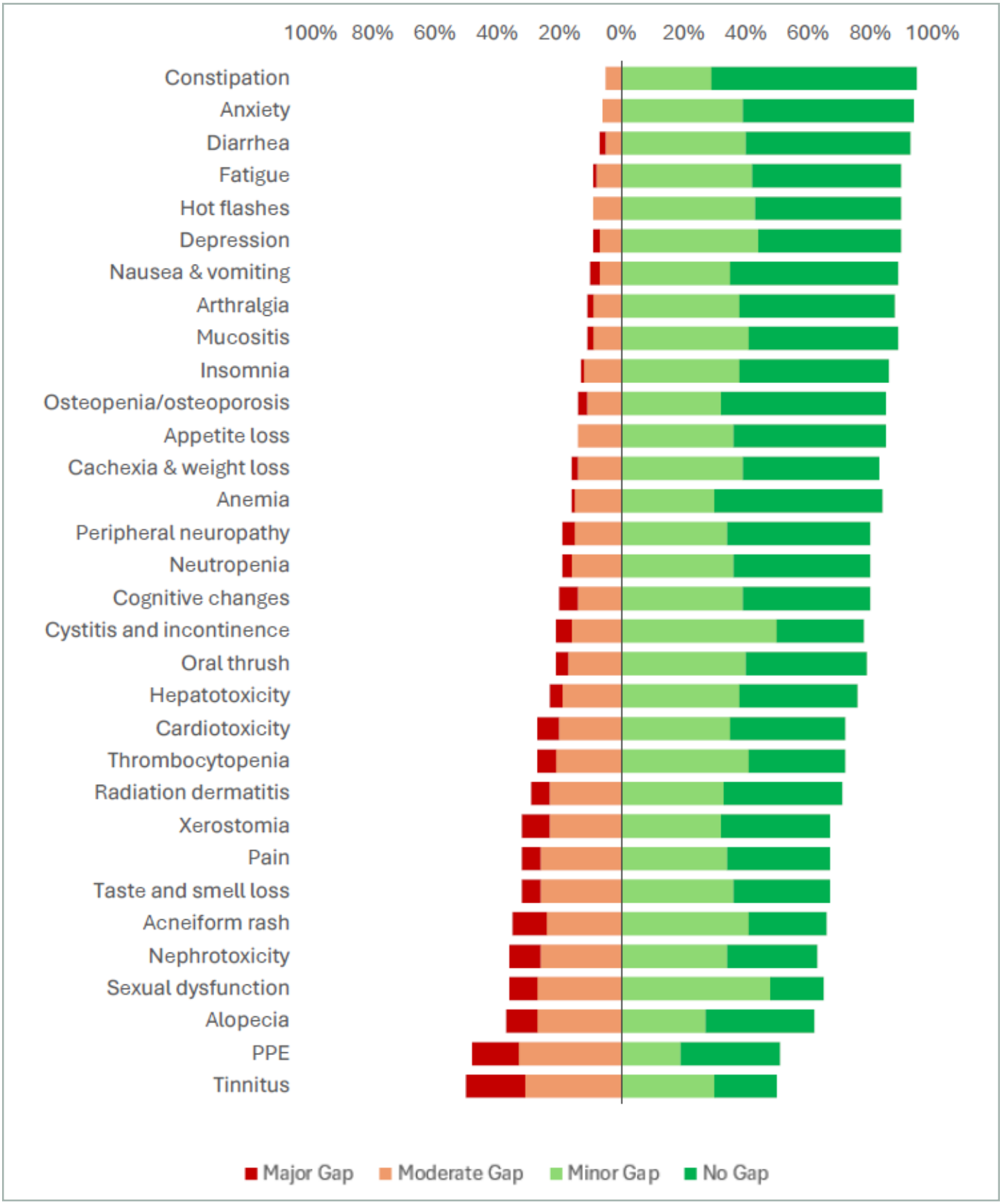

FIGURE 2 Knowledge Gaps Related to Managing Symptoms of Patients with Cancer. Percentage refers to the percentage of respondents who provided an answer. Respondents were instructed not to answer if they did not treat the condition listed. See Appendix A, Table S8, for number of respondents. PPE = palmar plantar erythrodysesthesia.

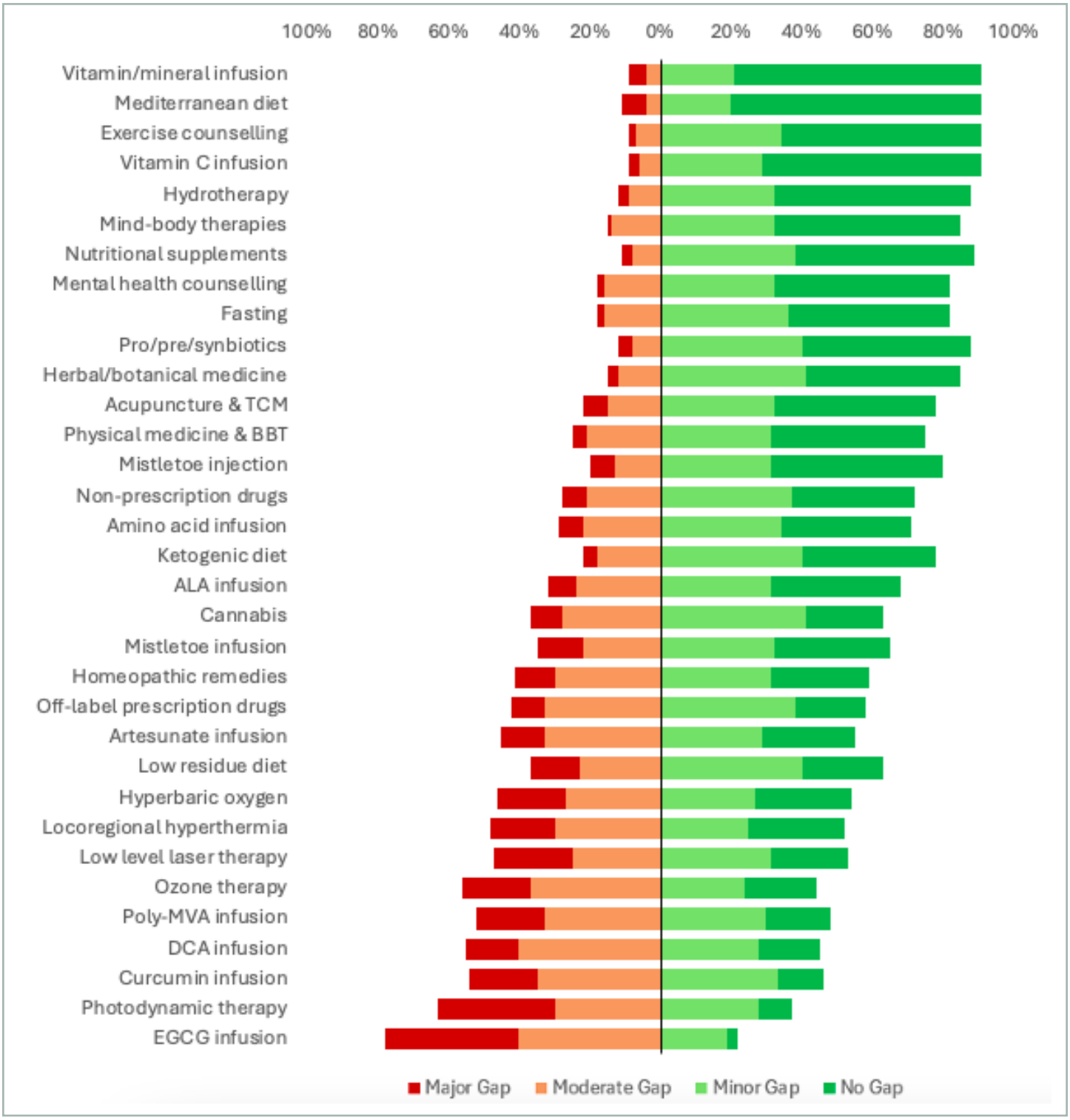

FIGURE 3 Knowledge Gaps Related to Naturopathic Interventions for Patients with Cancer. Percentage refers to the percentage of respondents who provided an answer. Participants were instructed not to answer if they did not provide the treatment listed. See Appendix A, Table S8, for number of respondents. ALA: Alpha lipoic acid; BBT: Body-based therapies; DCA: Dichloroacetate; EGCG: Epigallocatechin gallate; Poly-MVA: proprietary blend of "minerals, vitamins and amino acids"; TCM: Traditional Chinese Medicine.

provide care to people with lung cancer; however, lung cancer had the highest incidence of all cancer types in 2022.[18] Regarding the type of care provided, a much smaller proportion of NDs provide end-of-life care (48%) compared with preventive care (93%), care during conventional treatments (91%), or survivorship care (96%).

A recent study in the United States reported that patients receiving hospice care often do not receive support for concerns such as anxiety, depression, and general symptom relief—concerns for which NDs reported minor to no knowledge gaps, and for which there are existing practice guidelines.[5,19] Additionally, this care was usually

provided at home by a family member, with caregivers expressing a need for hospice training.[19] This could be a gap in care that NDs are well suited to address.

Communication between NDs and conventional medical providers was not extensive and noted to occur once per month or less. This is in line with prior research showing that communication between NDs and other practitioners is lacking.[20] A collaborative interprofessional approach can help to identify and address patient needs. NDs could support this by providing consultation notes to oncologists more often, with treatment recommendations and rationale.

ND-Identified Knowledge Gaps in Supportive Cancer Care

Naturopathic doctors surveyed were generally confident in the treatments they provide and in managing symptoms and side effects. Of the 76 prompts for knowledge gaps, 46 (61%) had a mean score ≤ 1.0 out of 3.0 (minor gap or less). The lowest gaps (mean score ≤ 0.5 out of 3.0) were reported for exercise counselling, the Mediterranean diet, vitamin/mineral infusions, and IV vitamin C, as well as for managing constipation and anxiety. It is not surprising that exercise counselling and the Mediterranean diet had the lowest knowledge gaps; physical activity and clinical nutrition are two of the main therapeutic pillars that NDs are trained in addressing with patients,[21] and both have a rigorous body of evidence to support their use in cancer care.[22-27] In general, NDs had lower knowledge gaps for interventions they used frequently, such as NHPs, nutrition counselling, and exercise. One notable exception is IV therapies; IV vitamin C and vitamin/mineral infusions had some of the lowest knowledge gaps, yet IV therapies were only "frequently" recommended by 45% of NDs.

In contrast, NDs reported the highest knowledge gaps for EGCG and curcumin infusions, photodynamic therapy, ozone therapy, and low-level laser therapy. This is not surprising, as responses indicate these therapies are recommended by NDs least often. Other possible reasons for high knowledge gaps with these therapies and their low frequency of use may include a lack of access to required medical supplies, a limited scope of practice (especially since 37% of respondents were from Ontario, where photodynamic therapy and ozone therapy are outside the scope of the profession), a paucity of research on the use of these therapies in cancer care, and/or the fact that they are not a core component of naturopathic cancer courses.[28,29] In total, there were 10 items (13%) where a moderate or major gap was reported by more than 50% of respondents.

Another area to highlight is that surveyed NDs who see patients with cancer the least often reported the highest degree of knowledge gaps, the most common reason being a lack of formal training. This was evident in all categories but was most pronounced for interactions between naturopathic and conventional treatments. NHPs have the potential to interfere with the safety and efficacy of conventional cancer treatments. Higher knowledge gaps regarding naturopathic treatments, their use, and their interaction potential could increase patient safety concerns and risk providing less effective care, especially if the ND does not recognize their lack of knowledge. This may be especially applicable to NDs who provide care for patients with cancer but do not necessarily focus their training or practice on cancer care. Although oncology specializations are not uniformly recognized, providing cancer support that is safe and evidence-informed requires additional training and a dedication to continuing education.

Creating Educational Tools and Clinical Resources

When asked to identify reasons for their knowledge gaps, the two most common responses were a lack of time to find and examine new data (68%) and a lack of formal training (47%). A lack of time may suggest that succinct and specific clinical resources could help address some of these knowledge gaps; however, follow-up questions are required. Additional follow-up may also clarify whether a lack of formal training pertains to training in naturopathic medical schools, integrative oncology elective courses, residencies, or whether NDs perceive a paucity of data on certain topics, which creates an obstacle to developing formal training.

Given there was no clear preference in the way NDs would like to receive clinical resources related to cancer care, future research should focus on addressing knowledge gaps and consider providing a variety of resources to accommodate different learning styles and preferences.

Strengths

This survey is the first to focus on the practice of integrative cancer care provided by NDs across North America. Using naturopathic social media platforms and professional associations to administer the survey allowed for a large, targeted reach, which resulted in a sample size that adequately addressed the study's research objectives. Despite taking an average of 12.5 minutes to complete and having only one mandatory question, response rates for each question were high. To minimize assessor bias, we included a broad range of items to address knowledge gaps, without overloading respondents. In question design, we used language which acknowledges the varying regulations across North America, for example, we used the term "integrative cancer care" rather than "integrative oncology," which is not accepted by some governing bodies. Additionally, we included "not applicable" response options to accommodate the diverse treatment preferences and scopes of practice. Lastly, the inclusion of a "general stream" provided insights into the demographic differences between NDs who offer cancer support and those who do not. This approach also helped identify barriers preventing the general stream from offering cancer support and potential ways to overcome these challenges.

Limitations

Despite the wide reach of this survey, the generalizability of survey findings is limited. A large portion of respondents graduated from CCNM's Toronto campus and practice in Ontario or British Columbia. Overall response rate was low, which could be due to the impersonal way the survey was distributed and/or the length of the survey. In most instances where NDs chose an option based on a Likert scale, the options required a subjective interpretation.

Because of this, we cannot say whether we accurately quantified knowledge gaps, given that what respondents felt was a minor or major gap could have differed. Furthermore, some prompts were specific and targeted, whereas others addressed broad treatment domains. For example, a curcumin infusion was a specific treatment, whereas the domain of NHP use spans a diverse range of products. It was not feasible to provide specificity across these larger domains. Additionally, it is not clear whether respondents interpreted knowledge gaps solely as gaps in their own personal knowledge, or if gaps in available literature were also considered. Finally, although it was not an objective of this study, we did not ask practitioners about their knowledge or experience in supporting historically marginalized groups, such as Indigenous Peoples, people of colour, people with disabilities, or LGBTQ+ persons. Future research should assess the knowledge gaps NDs may have in supporting these populations, with goals of creating resources and training to address healthcare disparities.

CONCLUSION

This survey described the type and extent of cancer care provided by NDs and identified knowledge gaps among respondents. Our results indicate that NDs are generally confident in their scope of practice, particularly with commonly used therapies. However, gaps exist which could be addressed through clinical resources. These include resources on interactions between naturopathic interventions and conventional treatments, managing certain side effects, information on treatment modalities, and sample templates for communications with conventional medical providers. It is unclear which items would be best suited as clinical tools and resources. Future work may involve follow-up with respondents to determine which resources would most benefit clinical practice. Furthermore, discussion with the Oncology Association for Naturopathic Physicians, the Society for Integrative Oncology, and oncologists may be helpful to enhance inter-provider collaboration and resource dissemination. Ultimately, clinical resource and guideline development could advance naturopathic cancer care, enhance integrative oncology and improve patient care.

Access to Data

Datasets utilized in this study are available by request only. Please contact Patterson Institute's executive director, Dugald Seely at dseely@thechi.ca, to request access to data not included in this manuscript.

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CONFLICTS OF INTEREST DISCLOSURE

We have read and understood the CAND Journal's policy on conflicts of interest disclosure and declare the following interests: Dr. Dugald Seely, ND, is the executive director of the Patterson Institute for Integrative Oncology Research and a contributing member to Vitazan Professional's "Naturopathic Doctor Medical Advancement Panel Solutions" (NDMAPS) team, who provided $100 to the Patterson Institute for Integrative Oncology Research at CCNM for each survey response. While this amount is managed by CCNM, the funding supports the compensation of the team at the Patterson Institute for Integrative Oncology Research. Thus, while indirect, this may constitute a significant financial interest (SFI) for Dr. Seely, ND, and other members of the team, given the number of survey respondents. Vitazan had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

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Advancing Naturopathic Cancer Care: A Survey of Naturopathic Doctors to Identify Practice Patterns and Knowledge Gaps

APPENDIX A: SUPPLEMENTARY MATERIALS

Part 1: Survey Questions

Part A: Getting to know you

1. How old are you?

2. Which gender do you most identify with?

3. Which school did you graduate from?

4. Which country do you primarily practice in?

5. In which province, territory, or state do you primarily practice?

6. Other than your naturopathic degree, do you have any other qualifications? Select all that apply.
    - Bachelor's degree
    - Master's degree
    - Doctor of Philosophy (PhD)
    - Doctor of Chiropractic (DC)
    - Doctor of Medicine (MD)
    - Doctor of Osteopathic Medicine (DO)
    - Diplomate of the Homeopathic Academy of Naturopathic Physicians (DHANP) Licensed
    - Acupuncturist (L.Ac.)
    - Nurse Practitioner (NP)
    - Physician Assistant (PA)
    - Registered Dietician (RD)
    - Registered Nurse (RN)
    - Other (please specify)
    - None of the above

7. How many years have you been practicing naturopathic medicine?

8. In which ways do you interact with patients and provide naturopathic care? Select all that apply.
    - One-on-one visits (virtual or in-person)
    - Live group programming (virtual or in-person)
    - Pre-recorded courses/educational sessions
    - Membership programs
    - Other (please specify)

9. If you conduct one-on-one visits, how do you conduct them?
    - In-person only
    - Virtual only
    - In-person and virtual
    - I don't conduct one-on-one visits
    - Other (please specify)

10. Approximately how many hours do you spend in patient visits/interactions each week? (Note: this includes in-person and virtual visits, but excludes administrative tasks, charting, and research)

11. Approximately how many hours per week do you spend on continuing education activities? (e.g., reading articles, attending webinars, etc.)

12. Which best describes the nature of your naturopathic practice setting(s)? Select all that apply.
    - Community (private practice) – sole practitioner
    - Community (private practice) – multi-ND practice
    - Community (private practice) – multidisciplinary practice
    - Hospital
    - Other (please specify)

Part B: Knowledge translation and resources

13. Regarding sources of information related to supporting your clinical care and decision-making, indicate how often you use the following.
    - Directly accessing medical literature through journals (e.g., CANDJ, Natural Medicine Journal, JAMA Oncology, Integrative Cancer Therapies) or publication databases (e.g., PubMed, Google Scholar, EMBASE, Cochrane Library)
    - Professional resources and databases (e.g., Up-To-Date, Clinical Key, Natural Medicine Database, MSKCC About Herbs, professional monographs, Medscape, Examine.com.)
    - KNOWIntegrativeOncology.org textbooks (including e-texts)
    - Conferences, webinars, and/or seminars
    - Discussion with colleagues
    - Lay resources (e.g., magazines, books, blogs, Wikipedia, etc.)

14. Of the resources listed below, please indicate your degree of preference for each item, from "I love this resource" to "I do not like this resource."
    - Clinical decision aid (a tool that helps the clinician and/or patient understand their treatment options to make informed decisions based on best available evidence, includes information on available therapies, risks, benefits, etc.)
    - Clinical practice guideline (statements that include expected clinical standards intended to optimize patient care based on best available evidence)
    - Conference presentations
    - Courses or fellowship programs
    - Professional monographs (detailed summary of interventions, not always published in peer-review format)
    - Webinars

15. Would you support the development of clinical practice guidelines or clinical decision-making tools for naturopathic therapies in cancer care?

16. Do you consider yourself a naturopathic doctor (ND) who provides cancer care (including supportive cancer care)?

Part C: Getting to know your clinical practice

17. Are you a Fellow of the American Board of Naturopathic Oncology?

18. Are you a member of any oncology-specific organizations? Select all that apply.
    - American Society of Clinical Oncology (ASCO)
    - Oncology Association of Naturopathic Physicians (OncANP)
    - Society for Integrative Oncology (SIO)
    - The Multinational Association of Supportive Care in Cancer (MASCC)
    - Other (please specify)

19. What percentage of your clinical practice is providing care related to cancer?

20. Where along the cancer care continuum do you provide care? Select all that apply.
    - Primary prevention (i.e., never had cancer)
    - Secondary prevention (i.e., previous history of cancer)
    - During active conventional treatment
    - After completion of conventional treatment (i.e., survivorship or aftercare)
    - Having declined conventional treatments
    - End-of-life care
    - Other (please specify)

21. Of patients who present for cancer care, how often do you provide care for the following age ranges?
    - Children (<12)
    - Adolescents (12–17)
    - Young adults (18–39)
    - Adults (40–64)
    - Older adults (>64)

22. Of patients who present for cancer care, how often do you provide care for the following types?
    - Brain and CNS (central nervous system)
    - Breast
    - Gastrointestinal (e.g., colorectal, esophageal, liver, gastric, pancreatic, hepatobiliary)
    - Gynecological (e.g., cervical, endometrial, ovarian, vaginal, vulvar)
    - Head and neck (e.g., oropharyngeal, laryngeal)
    - Hematological (e.g., lymphomas, leukemias and multiple myeloma)
    - Sarcomas
    - Skin (melanoma, basal cell carcinoma, squamous cell carcinoma)
    - Thoracic (e.g., lung, thymic, mediastinal)
    - Urogenital (e.g., prostate, bladder, kidney, testicular)

23. Which of the following acts are you qualified and able to perform? Select all that apply.
    - Prescribe certain pharmaceutical medications
    - Perform acupuncture
    - Perform intravenous infusion therapy (IVIT)
    - Perform injections (subcutaneous and/or intramuscular)
    - None of the above

24. Considering the following interventions, regardless of whether or not they are in your scope, please indicate how frequently you recommend them or refer out for patients with cancer.
    - Acupuncture and/or Traditional Chinese Medicine
    - Body-based therapies (e.g., spinal manipulations, manual lymphatic techniques, massage)
    - Cannabis (oil, dry products, edibles, etc.)
    - Exercise counselling
    - Herbal/botanical medicine (tinctures, extracts, tea, etc.)
    - Homeopathic remedies
    - Hydrotherapy and thermal therapy (e.g., constitutional hydrotherapy, saunas, cold- immersions, sitz baths)
    - Hyperbaric oxygen
    - Hyperthermia – locoregional
    - Hyperthermia – whole body
    - IVIT
    - Low level laser therapy (LLT)
    - Mental health counselling
    - Mind-body therapies (e.g., meditation, yoga, tai chi, Qigong, breathwork)
    - Non-IV injection therapy (e.g., intramuscular, subcutaneous, etc.)
    - Non-prescription/over-the-counter medication
    - Nutritional counselling – general
    - Nutritional counselling – specific diets

- Nutritional supplements (e.g., vitamins, minerals, fatty acids)
- Ozone
- Photodynamic therapy
- Prescription medications (off-label use)
- Probiotics/prebiotics/synbiotics
- Other (if there are other interventions not previously listed, please note them and how frequently you recommend/refer out for them)

25. How often do you communicate with conventional oncology medical doctors such as surgeons, medical oncologists, or radiation oncologists? (e.g., letters, faxes, phone, email)

26. How often do you communicate with allied healthcare providers such as other NDs, RMTs (registered massage therapists), NPs (nurse practitioners), holistic nutritionists, physiotherapists, functional medicine–oriented MDs, etc.? (e.g., letters, faxes, phone, email)

Part D: Identifying gaps in knowledge and training

27. Regarding interactions between naturopathic interventions and the following conventional cancer treatments, please indicate to what extent you feel there is a gap in your knowledge. If you do not work with patients receiving a certain treatment, please select "not applicable."
    - Chemotherapy
    - Hormonal therapy (e.g., androgen deprivation therapy, anti-estrogen therapies)
    - Monoclonal antibodies (e.g., PD1 inhibitors, trastuzumab)
    - Oral targeted therapy (e.g., tyrosine kinase inhibitors, CDK4/6 inhibitors)
    - Photodynamic therapy
    - Radiation therapy
    - Stem cell transplant
    - Surgery

28. Regarding naturopathic management of side effects and symptoms associated with cancer and/or cancer treatments, please indicate to what extent you feel there is a gap in your knowledge and your ability to treat or prevent this condition. If you do not work with a certain side effect or symptom, please select "not applicable."
    - Anxiety
    - Acneiform rash
    - Alopecia
    - Anemia
    - Appetite loss (anorexia)
    - Arthralgia
    - Cachexia and weight loss
    - Cardiotoxicity
    - Cognitive changes
    - Constipation
    - Cystitis and incontinence
    - Depression
    - Diarrhea
    - Edema and lymphedema
    - Fatigue
    - Hepatotoxicity
    - Hot flashes
    - Insomnia
    - Mucositis
    - Nausea and vomiting
    - Neutropenia
    - Nephrotoxicity

- Oral thrush
- Osteopenia/osteoporosis
- Pain
- Palmar plantar erythrodysesthesia (PPE or hand-foot syndrome)
- Peripheral neuropathy
- Radiation dermatitis
- Sexual dysfunction
- Taste and smell loss
- Thrombocytopenia
- Tinnitus
- Xerostomia

29. Regarding the use of Natural Health Products (NHPs) for supporting patients with cancer, please indicate to what extent you feel there is a gap in your knowledge. If you do not use a certain type of NHP, please select "not applicable."
    - Herbal/botanical medicine (tinctures, extracts, tea, etc.)
    - Homeopathic remedies
    - Nutritional supplements (e.g., vitamins, minerals, fatty acids)
    - Probiotics, prebiotics, synbiotics

30. Regarding specific diets for patients with cancer, please indicate to what extent you feel there is a gap in your knowledge. If you do not use or recommend a specific diet, please select "not applicable."
    - Fasting (e.g., intermittent fasting, short-term fasting around chemo, longer fasts)
    - Ketogenic diet
    - Low residue diet
    - Mediterranean diet
    - Other (If there is a gap in your knowledge about other specific diets, please note the diet and the degree of your knowledge gap(s) here)

31. Regarding injectable therapies for patients with cancer, please indicate to what extent you feel there is a gap in your knowledge. If you do not use or recommend a certain therapy, please select "not applicable."
    - Alpha-Lipoic Acid (ALA) (infusion)
    - Amino acid (infusion)
    - Artesunate (infusion)
    - Ascorbic acid (vitamin C) (infusion)
    - Curcumin (infusion)
    - Dichloroacetate (Infusion)
    - EGCG (infusion)
    - Mistletoe (infusion)
    - Mistletoe (subcutaneous injection)
    - Poly-MVA (infusion)
    - Vitamin/mineral mix (e.g., Myers infusion)
    - Other (If there is a gap in your knowledge about other injectable therapies, please note them and the degree of your knowledge gap(s) here)

32. Regarding the modalities listed below for patients with cancer, please indicate to what extent you feel there is a gap in your knowledge. If you do not use or recommend this intervention, please select "not applicable."
    - Acupuncture, acupressure, and Traditional Chinese Medicine
    - Cannabis (oil, dry products, edibles, etc.)
    - Exercise counselling
    - Hydrotherapy
    - Hyperbaric oxygen
    - Locoregional hyperthermia
    - Low level laser therapy (LLLT)
    - Mental health counselling
    - Mind-body therapies

- Non-prescription drugs/over-the-counter
- Off-label prescription medications for cancer control
- Ozone therapy
- Photodynamic therapy
- Physical medicine and body-based therapies
- Prescription medications (off-label for cancer control)
- Other (If there is a gap in your knowledge about other modalities, please note them and the degree of your knowledge gap(s) here)

33. Part of medical practice is remaining up to date on new information and emerging therapies. Regarding finding, appraising, and implementing new evidence related to naturopathic oncology, please indicate to what extent you feel there is a gap in your knowledge.

34. Thinking in general about gaps in your knowledge, please indicate reasons for these gaps. Select all that apply.
    - Lack of formal training (e.g., in school, through continuing education, through residency/fellowship programs)
    - Lack of time to find resources and do continuing education
    - Unsure of how to find available data and resources
    - Unsure of how to critically appraise (assess or interpret) available data
    - Lack of resources (e.g., access to professional resources and clinical research)
    - Other (If you think there are other reasons for gaps in your knowledge, please list them)

Interest in providing cancer care

35. Are you interested in developing your skills in order to support people with cancer?

36. Regarding why you don't currently work with cancer populations, please indicate which of the following barriers/reasons are relevant to you. Select all that apply.
    - There is no demand or need in my community
    - I don't have the knowledge or training to do so
    - I am concerned about legal/liability issues and/or regulatory restrictions
    - I am concerned about the emotional burden
    - Other (If there are other barriers/reasons why you don't currently work with cancer populations, please note them)

37. Would the availability of better training and resources for naturopathic oncology increase your likelihood of working with this population?

Follow-up and additional information

38. If researchers at The Patterson Institute have follow-up questions, are you open to being contacted by email?

39. Is there anything else you would like to add?

40. Please input your email address below to access Vitazan's promotion; if you would like to skip the offer, please leave this blank.

Part 2: Supplementary Tables

TABLE S1: Other academic and professional qualifications

Type of Qualification	General Stream *n* (%)	Cancer Stream *n* (%)	Total *n* (%)
Bachelor's Degree	47 (94)	78 (79)	125 (84)
Master's Degree	2 (4)	23 (23)	25 (17)
Doctor of Philosophy (PhD)	0	4 (4)	4 (3)
Registered or Licensed Acupuncturist (RAc/LAc)	1 (2)	8 (8)	9 (6)
Doctor of Medicine (MD)	1 (2)	8 (8)	9 (6)
Doctor of Osteopathic Medicine (DO)	1 (2)	0	1 (1)
Physician Assistant (PA)	0	1 (1)	1 (1)
Registered Nurse (RN)	0	1 (1)	1 (1)
DHANP	0	1 (1)	1 (1)
Registered Herbalist (RH)	0	2 (2)	2 (1)
Registered Massage Therapist (RMT)	0	1 (1)	1 (1)

General *n* = 50; Cancer *n* = 99; Total *N* = 149. Multiple selections were permitted. DHANP = diploma from the Homeopathic Academy of Naturopathic Physicians.

TABLE S2: State or Province of Practice

State/Province	General Stream *n* (%)	Cancer Stream *n* (%)	Total *n* (%)
Canada			
Alberta	0	2 (2)	2 (1)
British Columbia	10 (20)	13 (14)	23 (16)
Manitoba	0	3 (3)	3 (2)
Nova Scotia	6 (12)	3 (3)	9 (6)
Ontario	25 (50)	29 (30)	54 (37)
Quebec	1 (2)	0	1 (1)
USA			
Arizona	1 (2)	2 (2)	3 (2)
California	2 (4)	2 (2)	4 (3)
Colorado	3 (6)	2 (2)	5 (3)
Connecticut	0	3 (3)	3 (2)
Hawaii	0	2 (2)	2 (1)
Illinois	0	1 (1)	1 (1)
Indiana	0	1 (1)	1 (1)
Maine	0	2 (2)	2 (1)
Michigan	1 (2)	1 (1)	2 (1)
Missouri	0	2 (2)	2 (1)
Montana	0	2 (2)	2 (1)
New York	0	1 (1)	1 (1)
Oregon	0	8 (8)	8 (5)
Pennsylvania	0	1 (1)	1 (1)
Texas	0	1 (1)	1 (1)
Washington	0	8 (8)	8 (5)
Washington DC	0	2 (2)	2 (1)
Wisconsin	1 (2)	0	1 (1)
Outside of Canada/USA	0	5 (5)	5 (3)

General *n* = 50; Cancer *n* = 96; Total *N* = 146. Three respondents in the cancer stream did not provide a response.

TABLE S3: Type of visit conducted

Type of Visit	General Stream *n* (%)	CancerStream *n* (%)	Total *n* (%)
In-person and virtual	42 (84)	89 (90)	131 (88)
In-person only	4 (8)	6 (6)	10 (7)
Virtual only	4 (8)	4 (4)	8 (5)

General *n* = 50; Cancer *n* = 99; Total *N* = 149.

TABLE S4: Membership in oncology-specific organizations

Organization	*n* (%)
Oncology Association of Naturopathic Physicians	61 (64)
Society for Integrative Oncology	10 (10)
American Society of Clinical Oncology	6 (6)
Multinational Association of Supportive Care in Cancer	2 (2)
Other	7 (7)
Not a member of any organizations	32 (33)

N = 96 respondents from the cancer stream. Three respondents did not provide a response. Multiple selections were permitted.

TABLE S5: How often naturopathic doctors communicate with other practitioners

Frequency	*n* (%)
Conventional medical providers	
Frequently (at least once per week)	27 (27)
Occasionally (at least once per month)	27 (27)
Rarely (less than once per month)	35 (35)
Never	10 (10)
Allied healthcare providers	
Frequently (at least once per week)	40 (40)
Occasionally (at least once per month)	40 (40)
Rarely (less than once per month)	18 (18)
Never	1 (1)

N = 99 respondents from the cancer stream.

TABLE S6: How often naturopathic doctors provide cancer care for the following age ranges

Age Range (years)	Frequently (3)	Occasionally (2)	Rarely (1)	Never (0)	Mean Score (/3)	N (responses)
< 12	2 (2%)	5 (5%)	27 (30%)	57 (63%)	0.5	91
From 12 to 17	3 (3%)	7 (8%)	36 (40%)	45 (49%)	0.6	91
From 18 to 39	15 (16%)	46 (49%)	24 (26%)	9 (10%)	1.7	94
From 40 to 64	75 (76%)	17 (17%)	7 (7%)	0	2.7	99
> 64	68 (69%)	24 (24%)	6 (6%)	1 (1%)	2.6	99

Responses provided by the cancer stream only. Number of responses differs as some participants did not respond to each prompt.

TABLE S7: How often naturopathic doctors provide care for the following cancer types

Cancer Type	Frequently (3)	Occasionally (2)	Rarely (1)	Never (0)	Mean score (/3)	N (responses)
Breast	80 (82%)	13 (13%)	4 (4%)	0	2.8	97
Gastrointestinal	60 (61%)	24 (25%)	13 (13%)	2 (2%)	2.4	99
Gynecological	48 (48%)	37 (38%)	11 (11%)	2 (2%)	2.3	98
Urogenital	42 (42%)	35 (35%)	17 (18%)	5 (5%)	2.1	99
Hematological	29 (29%)	40 (40%)	23 (23%)	7 (7%)	1.9	99
Thoracic	19 (20%)	31 (32%)	31 (32%)	16 (16%)	1.5	97
Brain & CNS	12 (12%)	40 (41%)	33 (34%)	13 (13%)	1.5	98
Head/Neck	11 (11%)	38 (39%)	33 (34%)	15 (15%)	1.5	97
Skin	4 (4%)	46 (47%)	43 (44%)	5 (5%)	1.5	98
Sarcoma	4 (4%)	31 (32%)	40 (42%)	21 (22%)	1.2	96

Responses provided by the cancer stream only. Number of responses differs as some participants did not respond to every prompt. CNS: Central nervous system

TABLE S8 (Part 1 of 2): Tabular breakdown of knowledge gaps

Item	No Gap (0)	Minor Gap (1)	Moderate Gap (2)	Major Gap (3)	Mean Score (/3)	Not Applicable[a]
Interactions between integrative treatments and conventional treatments						
Photodynamic therapy	5 (8%)	14 (22%)	19 (29%)	27 (42%)	2.0	34
Stem cell transplant	11 (12%)	18 (20%)	33 (37%)	28 (31%)	1.9	9
Oral targeted therapies	16 (17%)	30 (31%)	31 (32%)	19 (20%)	1.6	3
Monoclonal antibodies	18 (18%)	32 (33%)	27 (28%)	21 (21%)	1.5	1
Radiation therapy	23 (23%)	47 (47%)	21 (21%)	8 (8%)	1.1	0
Chemotherapy	22 (22%)	48 (49%)	21 (21%)	7 (7%)	1.1	1
Hormonal therapy	30 (30%)	44 (44%)	21 (21%)	4 (4%)	1.0	0
Surgery	40 (40%)	40 (40%)	14 (14%)	5 (5%)	0.8	0
Management of symptoms and side effects associated with cancer and/or cancer treatments						
Tinnitus	19 (20%)	30 (31%)	30 (31%)	18 (19%)	1.5	2
Sexual and reproductive issues	17 (17%)	47 (48%)	25 (27%)	9 (9%)	1.3	1
PPE	30 (32%)	18 (19%)	31 (33%)	14 (15%)	1.3	6
Acneiform rash	23 (25%)	38 (41%)	22 (24%)	10 (11%)	1.2	6
Nephrotoxicity	29 (29%)	34 (34%)	26 (26%)	10 (10%)	1.2	0
Taste and smell loss	31 (31%)	36 (36%)	26 (26%)	6 (6%)	1.1	0
Pain	32 (33%)	33 (34%)	26 (27%)	6 (6%)	1.1	2
Alopecia	34 (35%)	26 (27%)	26 (27%)	10 (10%)	1.1	3
Xerostomia	35 (36%)	31 (32%)	22 (23%)	9 (9%)	1.1	2
Cystitis and incontinence	28 (29%)	49 (50%)	16 (16%)	5 (5%)	1.0	1
Thrombocytopenia	31 (31%)	41 (41%)	21 (21%)	6 (6%)	1.0	0
Cardiotoxicity	37 (37%)	35 (35%)	20 (20%)	7 (7%)	1.0	0
Radiation dermatitis	37 (38%)	32 (33%)	22 (23%)	6 (6%)	1.0	2
Hepatotoxicity	38 (38%)	38 (38%)	19 (19%)	4 (4%)	0.9	0
Oral thrush	38 (39%)	39 (40%)	17 (17%)	4 (4%)	0.9	1
Cognitive changes	40 (41%)	38 (39%)	14 (14%)	6 (6%)	0.9	1
Neutropenia	44 (44%)	36 (36%)	16 (16%)	3 (3%)	0.8	0
Peripheral neuropathy	46 (46%)	34 (34%)	15 (15%)	4 (4%)	0.8	0
Cachexia and weight loss	44 (44%)	39 (39%)	14 (14%)	2 (2%)	0.7	0
Mucositis	47 (48%)	40 (41%)	9 (9%)	2 (2%)	0.7	1
Insomnia	48 (48%)	38 (38%)	12 (12%)	1 (1%)	0.7	0
Depression	46 (46%)	44 (44%)	7 (7%)	2 (2%)	0.6	0
Hot flashes	47 (47%)	43 (43%)	9 (9%)	0	0.6	0
Fatigue	48 (48%)	42 (42%)	8 (8%)	1 (1%)	0.6	0
Appetite loss	49 (49%)	36 (36%)	14 (14%)	0	0.6	0
Arthralgia	50 (50%)	38 (38%)	9 (9%)	2 (2%)	0.6	0
Diarrhea	52 (53%)	40 (40%)	5 (5%)	2 (2%)	0.6	0
Osteopenia/osteoporosis	53 (54%)	32 (32%)	11 (11%)	3 (3%)	0.6	0
Nausea and vomiting	54 (55%)	35 (35%)	7 (7%)	3 (3%)	0.6	0
Anemia	54 (55%)	30 (30%)	14 (14%)	1 (1%)	0.6	0
Anxiety	54 (55%)	39 (39%)	6 (6%)	0	0.5	0
Constipation	65 (66%)	29 (29%)	5 (5%)	0	0.4	0
Natural health products for patients with cancer						
Homeopathic remedies	21 (28%)	23 (31%)	22 (30%)	8 (11%)	1.2	25
Herbal/botanical medicine	43 (43%)	41 (41%)	12 (12%)	3 (3%)	0.7	0
Pro-/pre-/synbiotics	46 (48%)	38 (40%)	8 (8%)	4 (4%)	0.7	3
Nutritional supplements	50 (50%)	38 (38%)	8 (8%)	3 (3%)	0.6	0

TABLE S8 (Part 2 of 2): Tabular breakdown of knowledge gaps

Item	No Gap (0)	Minor Gap (1)	Moderate Gap (2)	Major Gap (3)	Mean Score (/3)	Not Applicable[a]
Specific diets for patients with cancer (missing n = 1)						
Low residue diet	19 (23%)	35 (40%)	20 (23%)	12 (14%)	1.3	12
Ketogenic diet	37 (39%)	38 (40%)	17 (18%)	4 (4%)	0.9	2
Fasting	44 (46%)	35 (36%)	15 (16%)	2 (2%)	0.7	2
Mediterranean diet	69 (70%)	20 (20%)	4 (4%)	5 (5%)	0.4	0
Injectable therapies for patients with cancer						
EGCG infusion	1 (2%)	8 (19%)	17 (40%)	16 (38%)	2.1	57
Curcumin infusion	6 (13%)	16 (33%)	17 (35%)	9 (19%)	1.6	51
DCA infusion	8 (17%)	13 (28%)	19 (40%)	7 (15%)	1.5	52
Poly-MVA infusion	8 (19%)	13 (30%)	14 (33%)	8 (19%)	1.5	56
Artesunate infusion	14 (27%)	15 (29%)	17 (33%)	6 (12%)	1.3	47
Mistletoe infusion	22 (32%)	22 (32%)	15 (22%)	9 (13%)	1.2	31
ALA infusion	22 (37%)	18 (31%)	14 (24%)	5 (8%)	1.0	40
Amino acid infusion	22 (38%)	20 (34%)	13 (22%)	3 (5%)	0.9	41
Mistletoe injection	40 (48%)	26 (31%)	11 (13%)	6 (7%)	0.8	16
Vitamin C infusion	49 (62%)	23 (29%)	5 (6%)	2 (3%)	0.5	20
Vitamin/mineral infusion	54 (70%)	16 (21%)	3 (4%)	4 (5%)	0.4	22
Modalities for patients with cancer						
Photodynamic therapy	4 (10%)	11 (28%)	12 (30%)	13 (33%)	1.8	59
Ozone therapy	11 (20%)	13 (24%)	20 (37%)	10 (19%)	1.5	45
LLLT	14 (22%)	20 (31%)	16 (25%)	14 (22%)	1.5	35
LRHT	16 (27%)	15 (25%)	18 (30%)	11 (18%)	1.4	39
Hyperbaric oxygen	18 (28%)	17 (27%)	17 (27%)	12 (19%)	1.4	35
Off-label prescription drugs	15 (20%)	29 (38%)	25 (33%)	7 (9%)	1.3	23
Cannabis	18 (23%)	33 (41%)	22 (28%)	7 (9%)	1.2	19
Non-prescription drugs	31 (37%)	31 (37%)	18 (21%)	4 (5%)	0.9	15
Physical medicine and BBT	37 (44%)	26 (31%)	18 (21%)	3 (4%)	0.8	14
Acupuncture and TCM	39 (46%)	27 (32%)	13 (15%)	6 (7%)	0.8	14
Mental health counselling	46 (50%)	29 (32%)	15 (16%)	2 (2%)	0.7	7
Mind–body therapies	47 (53%)	28 (32%)	12 (14%)	1 (1%)	0.6	11
Hydrotherapy	49 (56%)	28 (32%)	8 (9%)	3 (3%)	0.6	11
Exercise counselling	56 (57%)	33 (34%)	7 (7%)	2 (2%)	0.5	1
Finding, appraising, and implementing new evidence						
Searching for new info	32 (32%)	38 (38%)	17 (17%)	12 (12%)	1.1	0
Critically appraising new info	28 (28%)	45 (45%)	21 (21%)	5 (5%)	1.0	0
Applying new info in practice	29 (29%)	45 (45%)	18 (18%)	7 (7%)	1.0	0

N = 99 respondents from the cancer stream. ALA: Alpha lipoic acid; BBT: Body-based therapies; DCA: Dichloroacetate; EGCG: Epigallocatechin gallate; LLLT: Low level laser therapy; LRHT: Locoregional hyperthermia; PPE: Palmar plantar erythrodysesthesia; Poly-MVA: proprietary blend of "minerals, vitamins and amino acids"; TCM: Traditional Chinese medicine.

[a] Respondents were asked to select "not applicable" if they do not work with patients receiving a particular conventional treatment, if the naturopathic therapies were not within their scope of practice, or if they do not use a given naturopathic therapy in their practice.

TABLE S9 (Part 1 of 2): Knowledge gap comparison based on percent of practice related to cancer

Item	≤ 25% of Practice Cancer-Focused		> 25% of Practice Cancer-Focused		*P* value
	No Gap + Minor Gap	Moderate + Major Gap	No Gap + Minor Gap	Moderate + Major Gap	
Interactions between integrative treatments and conventional treatments					
Photodynamic therapy	4 (14%)	24 (86%)	15 (41%)	22 (59%)	0.02
Stem cell transplant	7 (19%)	29 (81%)	22 (41%)	32 (59%)	0.03
Oral targeted therapies	9 (23%)	30 (77%)	37 (65%)	20 (35%)	< 0.001
Monoclonal antibodies	14 (34%)	27 (66%)	36 (63%)	21 (37%)	0.005
Radiation therapy	26 (62%)	16 (38%)	44 (77%)	13 (23%)	0.10
Chemotherapy	19 (46%)	22 (54%)	51 (89%)	6 (11%)	< 0.001
Hormonal therapy	27 (64%)	15 (36%)	47 (82%)	10 (18%)	0.04
Total for category	**106 (39%)**	**163 (61%)**	**252 (67%)**	**124 (33%)**	**< 0.001**
Management of symptoms and side effects associated with cancer and/or cancer treatments					
Tinnitus	17 (41%)	24 (59%)	32 (57%)	24 (43%)	0.13
Sexual and reproductive issues	24 (57%)	18 (43%)	40 (71%)	16 (29%)	0.14
PPE	9 (24%)	29 (76%)	39 (71%)	16 (29%)	< 0.001
Acneiform rash	24 (63%)	14 (37%)	37 (67%)	18 (33%)	0.68
Nephrotoxicity	21 (50%)	21 (50%)	42 (74%)	15 (26%)	0.02
Taste and smell loss	24 (57%)	18 (43%)	43 (75%)	14 (25%)	0.54
Pain	29 (69%)	13 (31%)	36 (65%)	19 (35%)	0.71
Alopecia	23 (56%)	18 (44%)	37 (67%)	18 (33%)	0.26
Xerostomia	25 (60%)	17 (40%)	41 (75%)	14 (25%)	0.12
Cystitis and incontinence	33 (79%)	9 (21%)	44 (79%)	12 (21%)	> 0.99
Thrombocytopenia	25 (60%)	17 (40%)	47 (82%)	10 (18%)	0.01
Cardiotoxicity	23 (55%)	19 (45%)	49 (86%)	8 (14%)	0.001
Radiation dermatitis	21 (53%)	19 (48%)	48 (84%)	9 (16%)	0.001
Hepatotoxicity	30 (71%)	12 (29%)	46 (81%)	11 (19%)	0.28
Oral thrush	33 (79%)	9 (21%)	44 (79%)	12 (21%)	> 0.99
Cognitive changes	29 (71%)	12 (29%)	49 (86%)	8 (14%)	0.06
Total for category	**390 (59%)**	**269 (41%)**	**674 (75%)**	**224 (25%)**	**< 0.001**
Specific diets for patients with cancer					
Low residue diet	18 (51%)	17 (49%)	36 (71%)	15 (29%)	0.07
Ketogenic diet	28 (68%)	13 (32%)	47 (85%)	8 (15%)	0.04
Total for category	**46 (61%)**	**30 (39%)**	**83 (78%)**	**23 (22%)**	**0.009**
Injectable therapies for patients with cancer					
EGCG infusion	2 (11%)	16 (89%)	7 (29%)	17 (71%)	0.16
Curcumin infusion	6 (30%)	14 (70%)	16 (57%)	12 (43%)	0.06
DCA infusion	6 (30%)	14 (70%)	15 (56%)	12 (44%)	0.08
Poly-MVA infusion	8 (44%)	10 (56%)	13 (52%)	12 (48%)	0.62
Artesunate infusion	9 (45%)	11 (55%)	20 (63%)	12 (38%)	0.22
Mistletoe infusion	13 (52%)	12 (48%)	31 (72%)	12 (28%)	0.09
ALA infusion	13 (54%)	11 (46%)	27 (77%)	8 (23%)	0.06
Amino acid infusion	14 (58%)	10 (42%)	28 (82%)	6 (18%)	0.04
Mistletoe injection	19 (66%)	10 (34%)	47 (87%)	7 (13%)	0.02
Total for category	**90 (45%)**	**108 (55%)**	**204 (68%)**	**98 (32%)**	**< 0.001**

TABLE S9 (Part 2 of 2): Knowledge gap comparison based on percent of practice related to cancer

Item	≤ 25% of Practice Cancer-Focused		> 25% of Practice Cancer-Focused		*P* value
	No Gap + Minor Gap	Moderate + Major Gap	No Gap + Minor Gap	Moderate + Major Gap	
Modalities for patients with cancer					
Photodynamic therapy	3 (20%)	12 (80%)	12 (48%)	13 (52%)	0.08
Ozone therapy	7 (33%)	14 (67%)	17 (52%)	16 (48%)	0.19
LLLT	13 (54%)	11 (46%)	21 (53%)	19 (48%)	0.90
LRHT	8 (33%)	16 (67%)	23 (64%)	13 (36%)	0.02
Hyperbaric oxygen	15 (58%)	11 (42%)	20 (53%)	18 (47%)	0.69
Off-label prescription drugs	10 (37%)	17 (63%)	34 (69%)	15 (31%)	0.006
Cannabis	16 (47%)	18 (53%)	35 (76%)	11 (24%)	0.008
Non-prescription drugs	21 (62%)	13 (38%)	41 (82%)	9 (18%)	0.04
Physical medicine & BBT	29 (83%)	6 (17%)	34 (69%)	15 (31%)	0.16
Acupuncture and TCM	27 (75%)	9 (25%)	39 (80%)	10 (20%)	0.62
Total for category	**149 (54%)**	**127 (46%)**	**276 (67%)**	**139 (33%)**	**0.001**

P value calculated using Chi-square test. Total for each category counts each patient multiple times. ALA: Alpha lipoic acid; BBT: Body-based therapies; DCA: Dichloroacetate; EGCG: Epigallocatechin gallate; LLLT: Low level laser therapy; LRHT: Locoregional hyperthermia; PPE: Palmar plantar erythrodysesthesia; Poly-MVA: proprietary blend of "minerals, vitamins and amino acids"; TCM: Traditional Chinese medicine.

TABLE S10: Ways naturopathic doctors obtain information

Item	Frequently (3)	Occasionally (2)	Rarely (1)	Never (0)	Mean Score (/3)	N (responses)
Direct access to literature through journals	103 (69%)	40 (27%)	5 (3%)	1 (1%)	2.6	149
Professional resources and databases	87 (58%)	47 (32%)	12 (8%)	3 (2%)	2.5	149
Discussion with colleagues	63 (43%)	68 (46%)	15 (10%)	2 (1%)	2.3	148
Conferences, webinars, or seminars	62 (42%)	71 (48%)	15 (10%)	0	2.3	148
Textbooks	30 (20%)	56 (38%)	51 (34%)	11 (7%)	1.7	148
KNOW website	21 (22%)	23 (24%)	21 (22%)	31 (32%)	1.3	96[a]
Lay (non-scientific) resources	21 (14%)	28 (19%)	77 (52%)	23 (15%)	1.3	149

Number of responses differs as some participants did not respond to each prompt. Only includes respondents from the cancer stream.
KNOW: Knowledge in Integrative Oncology.

TABLE S11: Degree of preference for various resources

Item	I Love This Resource (3)	I Like This Resource (2)	I Somewhat Lke This Resource (1)	I Do Not Like This Resource (0)	Mean Score (/3)	N (responses)
Clinical decision aid	85 (59%)	35 (24%)	22 (15%)	3 (2%)	2.4	145
Conference presentations	67 (46%)	58 (39%)	20 (14%)	2 (1%)	2.3	147
Professional monographs	68 (46%)	56 (38%)	22 (15%)	3 (2%)	2.3	149
Webinars	66 (45%)	65 (44%)	15 (10%)	2 (1%)	2.3	148
Clinical practice guideline	65 (45%)	48 (33%)	27 (19%)	4 (3%)	2.2	144
Courses or fellowship programs	56 (39%)	60 (42%)	23 (16%)	5 (3%)	2.2	144

Number of responses differs as some participants did not respond to each prompt.

TABLE S12: Interest in providing cancer care

Question	*n* (%)
Are you interested in developing your skills in order to support people with cancer?	
Yes	23 (46)
No	11 (22)
Unsure	16 (32)
Regarding why you don't currently work with cancer populations, please indicate which of the following barriers/reasons are relevant to you. (Multiple selections permitted. Those who selected "No" above, n = 11, excluded)	
There is no demand or need in my community	4 (10)
I don't have the knowledge or training to do so	31 (79)
I am concerned about legal/liability issues and/or regulatory restrictions	12 (31)
I am concerned about the emotional burden	14 (36)
Other	6 (15)
Would the availability of better training and resources for naturopathic oncology increase your likelihood of working with this population?	
Yes	29 (74)
No	0
Unsure	10 (26)

N = 50 respondents from the general stream.

TABLE S13: Time spent on continuing education

Hours Per Week	General Stream *n* (%)	Cancer Stream *n* (%)	Total *n* (%)
≤ 1 hour	9 (18)	16 (16)	25 (17)
2 hours	20 (40)	42 (42)	62 (42)
3 hours	8 (16)	15 (15)	23 (15)
≥ 4 hours	13 (26)	26 (26)	39 (26)

General *n* = 50; Cancer *n* = 99; Total N = 149.

TABLE S14: Would you support the development of clinical practice guidelines or decision-making tools for naturopathic therapies in cancer care?

Degree of Support	General Stream *n* (%)	Cancer Stream *n* (%)	Total *n* (%)
Yes, strongly	37 (74)	74 (75)	112 (74)
Yes, somewhat	10 (20)	16 (16)	26 (17)
Unsure	2 (4)	6 (6)	8 (5)
No	1 (2)	3 (3)	4 (3)

General *n* = 50; Cancer *n* = 99; Total *N* = 149.