


Naturopathic Oncology Care for Pediatric Cancers: A Practice Survey

Integrative Cancer Therapies
Volume 18: 1–12
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DOI: 10.1177/1534735419878504
journals.sagepub.com/home/ict


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Abstract

Background: The majority of pediatric oncology patients report use of complementary and alternative medicine. Some naturopathic doctors (NDs) provide supportive pediatric oncology care; however, little information exists to formally describe this clinical practice. A survey was conducted with members of the Oncology Association of Naturopathic Physicians (OncANP.org) to describe recommendations across four therapeutic domains: natural health products (NHPs), nutrition, physical medicine, and mental/emotional support. **Results:** We had 99 respondents with a wide variance of clinical experience and aptitude to treat children with cancer. Of the majority (52.5%) of respondents who choose not to treat these children, the three primary reasons for this are lack of public demand (45.1%), institutional or clinic restrictions (21.6%), and personal reasons/comfort (19.6%). The 10 most frequently considered NHPs by all NDs are fish-derived omega-3 fatty acid (83.3%), vitamin D (83.3%), probiotics (82.1%), melatonin (73.8%), vitamin C (72.6%), homeopathic Arnica (69.0%), turmeric/curcumin (67.9%), glutamine (66.7%), *Astragalus membranaceus* (64.3%), and *Coriolus versicolor*/PSK (polysaccharide K) extracts (61.9%). The top 5 nutritional recommendations are anti-inflammatory diets (77.9%), dairy restriction (66.2%), Mediterranean diet (66.2%), gluten restriction (61.8%), and ketogenic diet (57.4%). The top 5 physical modality interventions are exercise (94.1%), acupuncture (77.9%), acupressure (72.1%), craniosacral therapy (69.1%), and yoga (69.1%). The top 5 mental/emotional interventions are meditation (79.4%), art therapy (77.9%), mindfulness-based stress reduction (70.6%), music therapy (70.6%), and visualization therapy (67.6%). **Conclusion:** The results of our clinical practice survey highlight naturopathic interventions across four domains with a strong rationale for further inquiry in the care of children with cancer.

Keywords

pediatric oncology, integrative oncology, naturopathic medicine, complementary and alternative medicine, CAM, pediatric cancer

Submitted March 9, 2019; revised August 21, 2019; accepted August 29, 2019

Introduction

A recent survey of pediatric specialty outpatient clinics in Canada found that 61% of pediatric oncology patients use some form of complementary and alternative medicine (CAM).¹ CAM use decisions by patients and their families are often self-directed and independent of the conventional oncology team. Furthermore, only 77% of CAM users informed their physician of this use and only 57% consulted a pharmacist.¹ This may, in part, be due to the lack of mechanisms at the institutional level for conventional care providers to assist their patients in making informed decisions

when it comes to CAM therapies and practitioners.² While CAM use remains high, the literature indicates that significant gaps exist in research.^{3,4} The high prevalence of use, potential for harm, and lack of evidence and resources

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warrants further research in order to meet the evidentiary demand for CAM efficacy and safety.

This is the first survey to our knowledge that examines current practice in the naturopathic medical community regarding pediatric oncology. Naturopathic oncology, provided by licensed naturopathic doctors (NDs), aims to improve quality of life, manage side effects, facilitate recovery, prevent recurrence, and educate the patient regarding adopting a healthy lifestyle.⁵ Naturopathic oncology practice is not to be provided as an alternative form of medicine but ideally in conjunction and inclusive of conventional oncology care in a manner consistent with integrative oncology.⁶

This survey gathered information from NDs who see patients with cancer regarding: (1) practitioner demographics (education, clinical practice, etc), (2) natural health product (NHP) use (recommendations, dosing, reasons for use, and contraindications), (3) nutrition counselling, (4) physical medicine interventions, and (5) mental-emotional treatments.

The primary objectives of this survey are the following: (1) to identify and enumerate the most common therapeutic recommendations (among the 4 principal domains); (2) to identify the principal reasons for use of the primary NHPs recommended; (3) to identify contraindications reported by the respondents regarding NHPs recommended; and (4) to identify characteristics of NDs focused in oncology with regard to their care of pediatric patients with cancer. A secondary objective of the survey was to identify similarities and differences between oncology-focused NDs who do and do not treat children with regard to their pediatric cancer care recommendations.

The survey structure was primarily based on a previously published project from the same institution (Ottawa Integrative Cancer Center) that investigated naturopathic thoracic cancer care, which influenced treatment decisions for a subsequent clinical trial (Thoracic Peri-Operative Integrative Surgical Care Evaluation [TPOISE]).⁷ Similarly, to the TPOISE project, this survey will act as a starting point for intervention information collection in order to decide on treatments that will be offered in a clinical setting. Question formulation and organization, intervention choices, data presentation, and general architecture of the Integrative Pediatric Oncology Program (IPOP) survey was influenced by the TPOISE survey.⁷ IPOP will provide and develop a safe and evidence-informed hospital-based IPOP, influenced by survey results.

Methods

Survey Content and Development

This survey was developed using the SurveyMonkey platform (<https://www.surveymonkey.com/>) and consisted of 2 main parts. Part 1 included questions pertaining to the

respondent's education, clinical practice, and whether or not they treated pediatric cancer cases. If they indicated that they did treat pediatric patients, they were queried about their clinical experience and pediatric case exposure. If the ND indicated that they did not treat pediatric patients, they were additionally asked to provide additional information through open-ended questions as to why they do not treat pediatric cases and the resources that would help them if they decided to pursue pediatric oncology care. Part 2 collected information regarding integrative therapies that respondents might recommend for pediatric cancer patients. Participants, including both those who do and do not treat children, were queried across 4 main domains of treatment including NHPs (56 options), Nutrition Counselling (12 options), Physical Interventions (12 options), and Mental-Emotional Interventions (14 options). A complete list of all 56 NHPs that were presented to respondents to choose from is available as a supplementary file (Supplementary File 1, available online). Open-text fields were available to enter interventions not listed. Respondents were asked to provide additional information on the NHP interventions selected regarding route of administration, dosing, reasons for use, and contraindications. In addition to the response options in the Nutrition Counselling domain, respondents were asked to provide general information regarding foods they encouraged and discouraged their patients to consume. No additional information was collected beyond selected interventions for the Physical Interventions and Mental-Emotional domains. It is important to note that respondents could skip sections/questions.

Prior to survey dissemination, 5 pilot testers with expertise in naturopathic oncology were recruited to take the survey and provide feedback. After refining, the survey was sent out to the study sample to a total of 447 recipients in May 2017. To encourage survey completion, the survey was advertised through social media (Twitter and Facebook). Seven rounds of reminder emails were sent to nonresponders and partial responders to encourage completion. An incentive prize draw was also promoted after completion of the study. The survey received ethics approval from the Canadian College of Naturopathic Medicine Research Ethics Board (CCNMREB017).

Respondent Characteristics and Selection Method

The survey was sent out to members of the Oncology Association of Naturopathic Physicians (OncANP), a professional organization composed of licensed NDs, naturopathic medical students, and allied health care providers primarily across North America. A membership list was acquired from the OncANP, and survey invitations were sent to those meeting the following inclusion criteria: having an "Active," "On Hold," or "Pending" subscription status and holding a membership classification of "FABNO

membership” or “Associate ND Membership.” Members with an “Expired” subscription status, a “Student Membership,” or “Allied Membership” classification were excluded. Of the 583 members on the OncANP mailing list, invitations were sent to 446 NDs. One ND who showed interest as a result of the social media campaign, but was not part of the OncANP membership, was subsequently sent an invitation. As such, 447 invitations were initially sent out. Altogether, there were 450 NDs, including 3 of the pilot testers, who were invited to complete the survey.

Data Analysis

Survey results were exported into Microsoft Excel 2016 (Microsoft Office, Redmond, WA) for analysis. Results are presented using descriptive statistics (counts and percentages). Open-ended questions were manually coded into general response categories by a single author (AP) using inductive coding with sampling and iterative re-coding. In the NHP domain, interventions that were selected by >50% of pediatric cancer treaters were considered as primary recommendations. A more detailed analysis of these NHP recommendations, including reason for use and contraindications, was conducted for these primary recommendations. For all other domains, recommendations selected by >50% of all respondents were also considered as primary recommendations. Differences between recommendations or considerations for interventions between pediatric treating NDs and non-pediatric treating NDs were compared using either the χ^2 test⁸ or Fisher’s exact test.⁹

Results

Survey Dissemination and Respondent Characteristics

A total of 99 responses were collected (96 through invitation and 3 from pilot testers), reflecting a 22.1% response rate. Of these, 67 (67.7%) were complete responses and 32 (32.3%) were partial responses. A total of 62.6% of respondents practice in the United States, 36.4% practice in Canada, and 1.0% practice in Greece. The top educational institution at which the NDs were trained was the Canadian College of Naturopathic Medicine (34.3%). Over one third of the respondents had between 11 and 19 years of clinical experience (37.4%). A total of 47.5% of respondents self-identified as treating pediatric oncology cases, whereas 52.5% stated that they do not treat pediatric oncology cases. Detailed respondent characteristics are summarized in Table 1.

Additional Information Collected From NDs Who Do Not Treat Pediatric Cases (N = 51)

The most frequent reason reported by respondents to explain why they do not treat pediatric cancer cases was

Table 1. Respondent Characteristics.

Characteristics	n (%)
Country of practice (n = 99)	
United States of America	62 (62.6)
Canada	36 (36.4)
Greece	1 (1.0)
Institution of education (n = 99)	
Canadian College of Naturopathic Medicine	34 (34.3)
National University of Natural Medicine ^a	27 (27.3)
Bastyr University	22 (22.2)
Southwest College of Naturopathic Medicine	12 (12.1)
Bridgeport University	2 (2.0)
Boucher Institute, School of Naturopathic Medicine	1 (1.0)
National University of Health Sciences	1 (1.0)
Years of clinical experience (n = 99)	
≤1 year	1 (1.0)
2-5 years	20 (20.2)
6-10 years	25 (25.3)
11-19 years	37 (37.4)
≥20 years	16 (16.2)
Amount of practice dedicated to cancer care (n = 99)	
≤25%	30 (30.3)
26% to 74%	30 (30.3)
75% to 99%	20 (20.2)
~100%	19 (19.2)
Distribution of those who do and do not treat pediatric cases	
Yes	47 (47.5)
No	52 (52.5)

^aThe National College of Natural Health has since changed to the National University of Naturopathic Medicine, and so “other” responses that included the new name were pooled all together under “National University of Naturopathic Medicine.”

an absence of public demand (ie, patients and families/caregivers not seeking the direct care of an ND; 45.1%). Overall, 59.7% of non-treater respondents reported a need for evidence-related resources (dosing, safety, clinical data/research), and 35.8% required educational resources (training, conferences, mentorship). Further details from the survey respondents as to reasons for not treating pediatric cancer cases and the resources that would be needed to better support a change in this practice are outlined in Tables 2 and 3, respectively.

Natural Health Product Domains

Primary Recommendations. Eighty-four respondents provided complete information within the NHP domain (recommendations, reasons for use, reported contraindication, dosing, and administration). Eighteen NHPs were identified as primary recommendations (selected by >50% of those

who do treat pediatric cancer cases): vitamin D (88.4%), fish-derived omega-3 (86.0%), probiotics (86.0%), vitamin

Table 2. Reason for Not Treating Pediatric Cancer Cases^a (N = 51).

Reported Reason	n (%)
Absence of public demand	23 (45.1)
Institutional/clinic restrictions	11 (21.6)
Personal reasons/comfort	10 (19.6)
Perceived lack of training	6 (11.6)
Legal concern	2 (3.9)

^aMultiple responses allowed. N, number of respondents; percentages based on respondent number.

C (79.1%), melatonin (76.7%), turmeric (*Curcuma longa*, curcumin extract; 74.4%), glutamine (72.1%), homeopathic *Arnica* (67.4%), *Astragalus membranaceus* (62.8%), magnesium (citrate, bisglycinate, etc; 62.8%), *Coriolus versicolor* (60.5%), zinc (58.1%), *Boswellia serrata* (frankincense; 53.5%), coenzyme Q10 (53.5%), ginger (*Zingiber officinale*; 53.5%), green tea (*Camellia sinensis*, epigallocatechin-3-gallate [EGCG]; 53.5%), reishi (*Ganoderma lucidum*; 53.5%), and vitamin B complex (53.5%; Table 4).

Reasons for Use of Primary NHP Recommendations. Based on responses by both those who do treat and do not treat pediatric cancer cases, the reasons for use are presented in

Table 3. Resources Required and Requested to Begin Treating Pediatric Cases^a (N = 67).

Resource Type	n (%)
Evidence from clinical research	24 (35.8)
Education and training within college curriculum	12 (17.9)
Dosing information	11 (16.4)
Mentorship and peer support	7 (10.4)
Pharmacology and safety (ie, for interactions and contraindications)	5 (7.5)
Continuing educational conferences, webinars, and informal learning opportunities	5 (7.5)
None	3 (4.5)

^aMultiple responses allowed. N, number of respondents; percentages based on respondent number.

Table 4. Survey Recommended Natural Health Products.

Intervention	All NDs (N = 84), n (%)	Treaters (N = 43), n (%)	Non-Treaters (N = 41), n (%)	P
Omega-3 fatty acid (fish-derived)	70 (83.3)	37 (86)	33 (80.5)	.57
Vitamin D	70 (83.3)	38 (88.4)	32 (78)	.25
Probiotics	69 (82.1)	37 (86)	32 (78)	.40
Melatonin	62 (73.8)	33 (76.7)	29 (70.7)	.62
Vitamin C (ascorbic acid)	61 (72.6)	34 (79.1)	27 (65.9)	.22
<i>Arnica</i> (homeopathic)	58 (69)	29 (67.4)	29 (70.7)	.82
Turmeric (<i>Curcuma longa</i>)	57 (67.9)	32 (74.4)	25 (61)	.24
Glutamine	56 (66.7)	31 (72.1)	25 (61)	.36
<i>Astragalus</i> (<i>Astragalus membranaceus</i>)	54 (64.3)	27 (62.8)	27 (65.9)	.82
<i>Coriolus versicolor</i> (encompassing PSK extracts)	52 (61.9)	26 (60.5)	26 (63.4)	.83
Magnesium (citrate, bisglycinate, etc)	50 (59.5)	27 (62.8)	23 (56.1)	.66
Reishi (<i>Ganoderma lucidum</i>)	50 (59.5)	23 (53.5)	27 (65.9)	.27
Zinc	49 (58.3)	25 (58.1)	24 (58.5)	1.0
Green tea (<i>Camellia sinensis</i> , EGCG)	47 (56)	23 (53.5)	24 (58.5)	.67
Ginger (<i>Zingiber officinale</i>)	46 (54.8)	23 (53.5)	23 (56.1)	.83
Vitamin B complex	46 (54.8)	23 (53.5)	23 (56.1)	.83
Coenzyme Q10	44 (52.4)	23 (53.5)	21 (51.2)	1.0
<i>Boswellia serrata</i> (Frankincense)	40 (47.6)	23 (53.5)	17 (41.5)	.29

Abbreviations: NDs, naturopathic doctors; PSK, polysaccharide K; EGCG, epigallocatechin-3-gallate.

Table 5 for each of the 18 primary NHP recommendations. Respondents were allowed multiple responses that were in open-text format. The total number of respondents inputting for each NHP varied, with participants being able to skip the section if they chose. Notably, 4 reasons for use were significantly different between treaters and non-treaters. Both melatonin and green tea were recommended for their antineoplastic effects significantly more by those who do not treat pediatric cases compared with those who do ($P = .04$ and $P = .02$, respectively). Vitamin C was recommended significantly more for “other” uses than provided in the survey by non-treaters compared with treaters ($P = .02$). Homeopathic *Arnica* was recommended for general side effect management significantly more by non-treaters compared with treaters ($P = .003$).

Overall, 6 NHPs were primarily recommended for augmentation of the immune system (vitamin D, vitamin C, *Astragalus membranaceus*, *Coriolus versicolor*, *Ganoderma lucidum*, and zinc). Three NHPs were recommended primarily for anti-inflammatory effects (fish-derived omega-3, turmeric/curcumin, and *Boswellia serrata*). Two are primarily used for organ and tissue support (CoQ10 and homeopathic *Arnica*), which encompass endpoints such as postoperative recovery and cardiovascular support. Only one NHP was primarily recommended for antineoplastic activity (green tea/*Camellia sinensis*). All the remaining NHPs were primarily recommended for side effect-related endpoints; probiotics for gastrointestinal support (including diarrhea, constipation, and painful bowel movements), melatonin (insomnia and sleep quality), ginger (nausea/vomiting), magnesium for gastrointestinal support (including constipation and bowel movement regulation), and glutamine for general side effect management.

Contraindications of Use of Primary NHP Recommendations. All primary NHP recommendations, except homeopathic *Arnica*, had identified contraindications recorded by respondents. Contraindications identified for the primary NHP recommendations are presented in Table 5. No reported contraindications were significantly different between the 2 groups; however, radiation therapy almost achieved significance for treaters reporting it more often than non-treaters as a contraindication for green tea ($P = .05$). NHPs with specific cancer-type contraindications identified include melatonin (hematological cancers), *Astragalus membranaceus* (hematological cancers), *Coriolus versicolor* (hematological cancers), *Ganoderma lucidum* (hematological cancers), and *Boswellia serrata* (brain tumors). NHPs with specific chemotherapy agent interactions include fish-derived omega-3 (platinum-based chemotherapy), turmeric/curcumin (cyclophosphamide), *Coriolus versicolor* (cyclophosphamide), CoQ10 (anthracyclines), vitamin C (Velcade and methotrexate), vitamin D (tamoxifen), and vitamin B complex (5-fluorouracil

chemotherapy). Turmeric/curcumin, glutamine, green tea, vitamin C, CoQ10, and *Boswellia serrata* were also flagged for unspecified antineoplastic treatments.

NHPs reported to have perioperative/bleeding risk include fish-derived omega-3, turmeric/curcumin, *Ganoderma lucidum*, ginger, CoQ10, and *Boswellia serrata*. Recommendations that participants felt required further general investigation, without a specific contraindication reported, included fish-derived omega-3, *Ganoderma lucidum*, melatonin, green tea, *Coriolus versicolor*, vitamin C, vitamin D, zinc, *Astragalus membranaceus*, vitamin B complex, and *Boswellia serrata*.

It is of note to interpret these findings with caution, as while contraindications were reported by respondents, this does not necessarily reflect the current literature. A comprehensive review of NHP contraindications would be warranted and allow for a clear representation of true risks according to the best available data.

Dosing Approaches and Administration of Primary NHP Recommendations. Participants were asked to both identify dosing rules/approaches, which they commonly use, and also to provide typical dose ranges for each of the NHPs they chose in the previous section. Dosing approaches ranged widely between responders, primarily being based on different weight-adjusted rules. The route of administration (Table 5) for individual NHPs also varied between responders. The broad range of dosing could be as result of different NHP formulations (solid extract, dry herb, patent products, etc) and NDs accessing different sources of evidence to base recommendations on. The variance in dosing approaches and ranges is consistent with the need identified by non-treaters as an area that requires better elucidation.

Nutrition Counselling Interventions: Primary Recommendations

Sixty-eight of the respondents selected nutrition recommendations that they would generally use in practice from a list provided. Primary nutrition recommendations (selected by >50% of all respondents) included the following: anti-inflammatory focused diet (77.9%), dairy restriction (66.2%), Mediterranean diet (66.2%), gluten restriction (61.8%), ketogenic diet (57.4%), and low glycemic diet (52.9%). No significant differences were found for any nutrition recommendation between treaters and non-treaters (Table 6).

Physical Medicine Interventions: Primary Recommendations

Sixty-eight respondents selected physical medicine interventions that they would generally recommend in practice from a list provided. Primary physical medicine recommendations (selected by >50% of all respondents) included the

Table 5. Primary NHP Uses/Contraindications/Administration^a.

Intervention	Selection Rate (N = 84)	Reasons for Use	Contraindications	Route of Administration			
Omega-3 fatty acid (fish-derived)	83.3%	N = 44	N = 18	N = 58			
		Anti-inflammatory	81.8%	Perioperative risk	33.3%	Oral	100%
		Nutritional supp	38.6%	Drug interaction	38.9%		
		Side effect management	25.0%	Other	22.2%		
		Conventional care support	6.8%	Antineoplastic Tx	16.7%		
		Mental health supp	6.8%	Gastrointestinal Sx	11.1%		
		Augment immune system	4.5%	Reported to have none	5.6%		
		Organ and tissue supp	4.5%				
		Other	4.5%				
		General health/QOL	2.3%				
Sleep/insomnia	2.3%						
Vitamin D	83.3%	N = 45	N = 16	N = 62			
		Augment immune system	62.2%	Toxicity	50.0%	Oral	100%
		Antineoplastic	20.0%	Other	37.5%	Topical	3.2%
		General health/QOL	17.8%	Hypercalcemia	25.0%	Intravenous	1.6%
		Nutritional supp	17.8%	Antineoplastic Tx	12.5%	Injectable	1.6%
		Other	15.6%	Unspecified interaction	6.3%		
		Musculoskeletal supp	13.3%				
		Anti-inflammatory	8.9%				
Mental health supp	4.4%						
Side effect management	2.2%						
Probiotics	82.1%	N = 42	N = 22	N = 57			
		Gastrointestinal supp	61.9%	Immune suppression	90.5%	Oral	100%
		Augment immune system	45.2%	Other	9.5%		
		Side effect management	26.2%				
		Other	21.4%				
Melatonin	73.8%	N = 39	N = 13	N = 52			
		Sleep/insomnia	51.3%	Hematological cancers	46.2%	Oral	100%
		Antineoplastic	48.7%	Other	38.5%	Topical	3.9%
		Augment immune system	48.7%	Fatigue Sx	15.4%		
		Other	23.9%	Mental restlessness	15.4%		
Vitamin C (ascorbic acid)	72.6%	N = 37	N = 19	N = 52			
		Side effect management	17.9%	Unspecified interaction	15.4%		
		Mental health Supp	7.7%	Reported to have none	7.7%		
		General health/QOL	2.6%				
		Augment immune system	59.5%	Antineoplastic Tx	63.2%	Oral	86.5%
Arnica (homeopathic)	69.0%	N = 36	N = 7	N = 47			
		Other	37.8%	Other	21.1%		
		Antineoplastic	29.7%	Gastrointestinal Sx	10.5%		
		Organ and tissue supp	21.6%	Unspecified interaction	10.5%	Intravenous	55.8%
		General health/QOL	10.8%	Kidney stones	5.3%		
		Side effect management	10.8%			Injectable	1.9%
		Anti-inflammatory	5.4%				
		Nutritional supp	5.4%				
		Conventional care supp	5.4%				
Organ and tissue supp	58.3%	Reported to have none	100%	Oral	57.5%		
Pain management	36.1%						
Other	22.2%			Topical	42.6%		
Side effect management	16.7%						
Anti-inflammatory	11.1%			Intravenous	2.1%		
Augment immune system	2.8%						

(continued)

Table 5. (continued)

Intervention	Selection Rate (N = 84)	Reasons for Use	Contraindications	Route of Administration			
Turmeric (<i>Curcuma longa</i>)	67.9%	N = 36	N = 21	N = 50			
		Anti-inflammatory	86.1%	Antineoplastic Tx	81.0%	Oral	100%
		Antineoplastic	25.0%	Other	28.6%	Intravenous	10.0%
		Side effect management	19.4%	Perioperative risk	28.6%	Topical	4.0%
		Augment immune system	13.9%	Gastrointestinal Sx	14.3%		
		Conventional care supp	11.1%	Reported to have none	4.8%		
		Other	11.1%				
		General health/QOL	2.8%				
Glutamine	66.7%	N = 33	N = 7	N = 47			
		Side effect management	90.9%	Tumor promotion	57.1%	Oral	100%
		Gastrointestinal supp	66.7%	Antineoplastic Tx	43.0%		
		Other	12.1%	Other	14.3%		
		Nutritional supp	6.1%				
		Augment immune system	3.0%				
		General health/QOL	3.0%				
Astragalus (<i>Astragalus membranaceus</i>)	64.3%	N = 30	N = 9	N = 43			
		Augment immune system	96.7%	Other	33.3%	Oral	100%
		Side effect management	13.3%	Antineoplastic Tx	22.2%		
		Organ and tissue supp	10.0%	Hematological cancer	22.2%		
		Other	6.7%	Autoimmune diseases	11.1%		
		Antineoplastic	3.3%	Immunosuppressant Tx	11.1%		
		Energy/fatigue supp	3.3%	Toxicity	11.1%		
Coriolus versicolor (encompassing PSK extracts)	61.9%	N = 32	N = 7	N = 44			
		Augment immune system	90.6%	Hematological cancer	28.6%	Oral	100%
		Antineoplastic	9.4%	Other	28.6%		
		Side effect management	6.3%	Unspecified interaction	28.6%		
		Conventional care supp	3.1%	Allergy	14.3%		
		General health/QOL	3.1%	Antineoplastic Tx	14.3%		
Magnesium (citrate, bisglycinate, etc)	59.5%	N = 26	N = 9	N = 38			
		Gastrointestinal supp	50.0%	Gastrointestinal Sx	66.7%	Oral	100%
		Pain management	42.3%			Intravenous	18.4%
		Other	30.8%			Topical	13.2%
		Mental health supp	26.9%	Other	33.3%	Injectable	2.6%
		Side effect management	26.9%				
		Sleep/insomnia	23.1%				
		Anti-inflammatory	3.8%	Laxative use	11.1%		
Reishi (<i>Ganoderma lucidum</i>)	59.5%	N = 28	N = 7	N = 39			
		Augment immune system	89.3%	Hematological cancer	28.6%	Oral	100%
		Antineoplastic	10.7%	Reported to have none	28.6%		
		Organ and tissue supp	7.1%	Allergy	14.3%		
		Side effect management	7.1%	Autoimmune diseases	14.3%		
		Energy/fatigue supp	3.6%	Perioperative risk	14.3%		
Other	3.6%	Unspecified interaction	14.3%				

(continued)

Table 5. (continued)

Intervention	Selection Rate (N = 84)	Reasons for Use	Contraindications	Route of Administration			
Zinc	58.3%	N = 25	N = 8	N = 40			
		Augment immune system	60.0%	Gastrointestinal Sx	50.0%	Oral	100%
		Side effect management	32.0%				
		General health/QOL	12.0%	Toxicity	25.0%	Intravenous	20%
		Other	12.0%				
		Nutritional supp	12.0%	Copper deficiency	12.5%	Injectable	2.5%
		Organ and tissue supp	8.0%				
		Gastrointestinal supp	4.0%	Unspecified interaction	12.5%	Topical	2.5%
Antineoplastic	4.0%						
Green tea (<i>Camellia sinensis</i> , EGCG)	56.0%	N = 26	N = 11	N = 39			
		Antineoplastic	65.4%	Antineoplastic Tx	54.6%	Oral	100%
		Other	30.8%				
		Augment immune system	19.2%	Other	45.5%		
		Anti-inflammatory	11.5%				
		Side effect management	11.5%	Unspecified interaction	18.2%	Topical	5.1%
Ginger (<i>Zingiber officinale</i>)	54.8%	N = 25	N = 8	N = 38			
		Nausea/vomiting	56.0%	Gastrointestinal Sx	50.0%	Oral	100%
		Side effect management	36.0%	Perioperative risk	37.5%		
		Anti-inflammatory	24.0%	Toxicity	12.5%	Topical	2.6%
Vitamin B complex	54.8%	N = 23	N = 5	N = 39			
		Side effect management	56.5%	Unspecified interaction	40.0%	Oral	100%
		Energy/fatigue supp	39.1%				
		General health/QOL	39.1%	Reported to have none	40.0%	Intravenous	18.0%
		Other	17.4%				
		Mental health supp	8.7%	Antineoplastic Tx	20.0%	Injectable	7.7%
Coenzyme Q10	52.4%	N = 25	N = 9	N = 35			
		Organ and tissue supp	64.0%	Antineoplastic Tx	88.9%	Oral	100%
		Side effect management	28.0%	Perioperative risk	11.1%		
		Energy/fatigue supp	16.0%				
		Other	16.0%				
		Antineoplastic	4.0%				
		General health/QOL	4.0%				
		Nutritional supp	4.0%				
<i>Boswellia serrata</i> (Frankincense)	47.6%	N = 23	N = 8	N = 33			
		Anti-inflammatory	82.6%	Antineoplastic Tx	37.5%	Oral	97.0%
		Cerebral/general edema	21.7%	Brain tumor	25.0%	Topical	12.1%
		Side effect management	21.7%	Perioperative risk	12.5%		
		Augment immune system	13.0%	Toxicity	12.5%		
		Other	13.0%	Unspecified interaction	12.5%		
		Antineoplastic	8.7%				
Organ and tissue supp	4.3%						

Abbreviations: NHP, natural health products; N, number of respondents (% based on this value); supp, support; QOL, quality of life; Tx, treatment; Sx, side effects; injectable, includes both subcutaneous and intramuscular administration; PSK, polysaccharide K; EGCG, epigallocatechin-3-gallate.

^aData presented refers to response rates from all ND's (both treaters and non-treaters). Percentages based on number of respondents. Note that multiple responses from respondents were allowed. Response was selected significantly more by non-treaters compared with treaters ($P = .05$).

Table 6. Nutrition Domain^a.

Intervention	All NDs (68 Respondents), n (%)	Treaters (35 Respondents), n (%)	Non-Treaters (33 Respondents), n (%)	P (Treaters vs Non-Treaters)
Anti-inflammatory diet	53 (77.9)	30 (85.7)	23 (69.7)	.11
Dairy restriction	45 (66.2)	23 (65.7)	22 (66.7)	.93
Mediterranean diet	45 (66.2)	24 (68.6)	21 (63.6)	.67
Gluten restriction	42 (61.8)	22 (62.9)	20 (60.6)	.85
Ketogenic diet	39 (57.4)	22 (62.9)	17 (51.5)	.35
Low glycemic intervention	36 (52.9)	22 (62.9)	14 (42.4)	.09
Intermittent fasting	20 (29.4)	11 (31.4)	9 (27.3)	.71
Vegetarian intervention	16 (23.5)	8 (22.9)	8 (24.2)	.9
Paleolithic intervention	11 (16.2)	8 (22.9)	3 (9.1)	.13
Other (child preference focused, elimination diet/food sensitivity × 2, patient dependent × 3, “clean” food, juicing, nutrient dense [nonrestrictive])	9 (13.2)	5 (14.3) (Child preference focused, elimination diet/food sensitivity, “clean” food, juicing, nutrient dense [nonrestrictive])	4 (12.1) (Patient dependent × 3, elimination diet/food sensitivity)	.79
Vegan intervention	9 (13.2)	5 (14.3)	4 (12.1)	.79
Weight loss intervention	6 (8.8)	3 (8.6)	3 (9.1)	.94
Macrobiotic intervention	5 (7.4)	4 (11.4)	1 (3.0)	.19
None	1 (1.5)	0 (0.0)	1 (3.0)	.5

Abbreviation: NDs, naturopathic doctors.

^aMultiple responses allowed, and percentages based on respondent numbers.

following: exercise (94.1%), acupuncture (77.9%), acupressure (72.1%), craniosacral therapy (69.1%), yoga (69.1%), hydrotherapy (67.6%), and massage therapy (66.2%). No significant differences were found for any physical medicine recommendation between treaters and non-treaters (Table 7).

Mental-Emotional Interventions: Primary Recommendations

Sixty-eight respondents selected mental-emotional interventions that they would generally recommend from a list provided. Primary mental-emotional recommendations (selected by >50% of all respondents) included the following: meditation (79.4%), art therapy (77.9%), mindfulness-based stress reduction (70.6%), music therapy (70.6%), visualization (67.6%), cognitive-behavioral therapy (61.8%), progressive muscle relaxation (57.4%), diaphragmatic breathing (55.9%), psychotherapy (54.4%), and reiki (52.9%). No significant differences were found for any mental-emotional physical medicine recommendation between treaters and non-treaters (Table 8).

Discussion

This report provides important information to better understand common recommendations made by NDs and their clinical applications with regard to pediatric cancer care. The survey highlights naturopathic interventions spanning

4 interventional domains, collecting pertinent information regarding what is currently being recommended, what are the principal reasons for the recommendations, and what safety concerns are perceived to exist. The findings describe and characterize current demographics of NDs who offer cancer care for patients, including their educational background, place of practice, years of clinical experience, degree of involvement in pediatric cancer care, and resources requested for support if treating children with cancer. Furthermore, the results describe which interventions, along with their reasons for use, are likely to be recommended in clinical practices with regard to the 4 domains investigated. Given the broad scope of practice of NDs, these findings help us to better understand common trends of clinical focus currently occurring in naturopathic practice as they apply to pediatric integrative cancer care.

Results from this survey indicate that the primary reason for use of NHPs in pediatric oncology care is side effect/symptom management and supportive care, rather than direct treatment of the cancer. This finding contrasts certain aspects of the literature, which has found that patients and consumers of CAM therapies may not explicitly know NHPs are intended for supportive management and not direct antineoplastic effects.^{10,11} The most common reason for use of all 18 primary NHPs (except green tea/*EGCG/Camellia sinensis*) identified were side effect and symptom management related, both general and specific, and overall general supportive care. For example, while melatonin had 19 responses out of 78 relating

Table 7. Physical Domain^a.

Intervention	All NDs (N = 68 Respondents), n (%)	Treaters (N = 35 Respondents), n (%)	Non-Treaters (N = 33 Respondents), n (%)	P
Exercise	64 (94.1)	34 (97.1)	30 (90.9)	.28
Acupuncture	53 (77.9)	27 (77.1)	26 (78.8)	.87
Acupressure	49 (72.1)	25 (71.4)	24 (72.7)	.91
Craniosacral therapy	47 (69.1)	25 (71.4)	22 (66.7)	.68
Yoga	47 (69.1)	21 (60)	26 (78.8)	.09
Hydrotherapy	46 (67.6)	26 (74.3)	20 (60.6)	.23
Massage therapy	45 (66.2)	21 (60)	24 (72.7)	.27
Chiropractic	30 (44.1)	12 (34.3)	18 (54.5)	.09
Physiotherapy	27 (39.7)	14 (40)	13 (39.4)	.96
Hyperthermia (local/regional)	25 (36.8)	15 (42.9)	10 (30.3)	.28
Reflexology	24 (35.3)	14 (40)	10 (30.3)	.41
Other (free play, outdoor activities, cuddling, low level laser × 2, ultrasound, osteopathy × 2, Epsom salts, infrared sauna, nature exposure, sensory deprivation tank, abdominal breathing, mind-body therapy, Smiling Minds application, tai qi, qi gong)	17 (25)	12 (34.3) (free play, outdoor activities, cuddling, low level laser × 2, ultrasound, osteopathy × 2, infrared sauna, abdominal breathing, mind-body therapy, Smiling Mind application)	5 (15.2) (Epsom salts, nature exposure, sensory deprivation tank, tai qi, qi gong)	.07
Hyperthermia (whole body)	15 (22.1)	5 (14.3)	10 (30.3)	.11
None	2 (2.9)	0 (0.0)	2 (6.1)	.23

Abbreviation: NDs, naturopathic doctors.

^aMultiple responses allowed, and percentages based on respondent numbers.

Table 8. Mental and Emotional Domain^a.

Intervention	All NDs (68 Respondents), n (%)	Treaters (35 Respondents), n (%)	Non-Treaters (33 Respondents), n (%)	P
Meditation	54 (79.4)	28 (80)	26 (78.8)	.90
Art therapy	53 (77.9)	29 (82.9)	24 (72.7)	.31
Mindfulness-based stress reduction	48 (70.6)	23 (65.7)	25 (75.8)	.36
Music therapy	48 (70.6)	26 (74.3)	22 (66.7)	.50
Visualization	46 (67.6)	26 (74.3)	20 (60.6)	
Cognitive-behavioral therapy	42 (61.8)	22 (62.9)	20 (60.6)	.85
Progressive muscle relaxation	39 (57.4)	20 (57.1)	19 (57.6)	.97
Diaphragmatic breathing	38 (55.9)	20 (57.1)	18 (54.5)	.83
Reiki	36 (52.9)	18 (51.4)	18 (54.5)	.80
Biofeedback	34 (50)	16 (45.7)	18 (54.5)	.47
Therapeutic touch	34 (50)	21 (60)	13 (39.4)	.09
Psychotherapy	37 (54.4)	21 (60)	16 (48.5)	.35
Hypnotherapy (hypnosis)	21 (30.9)	13 (37.1)	8 (24.2)	.25
Other (faith-based spiritual counselling, HeartMath, floating sensory deprivation, nature walks, expressive art therapy)	5 (7.4)	1 (2.9) (expressive art therapy)	4 (12.1) (faith-based spiritual counselling, HeartMath, floating sensory deprivation, nature walks)	.15
Autogenic training	4 (5.9)	1 (2.9)	3 (9.1)	.28
None	4 (5.9)	1 (2.9)	3 (9.1)	.28

Abbreviation: NDs, naturopathic doctors.

^aMultiple responses allowed, and percentages based on respondent numbers.

to antineoplastic effects, it had 59 responses pertaining to supportive symptom management, including helping with insomnia, immune support, and conventional treatment support. It appears that NDs are currently using NHPs primarily to help support patients through conventional treatment and manage associated side effects/symptoms, with an emphasis on immune support. Furthermore, while there was variance regarding NHP recommendations between respondents, it appears that a small number of NHPs were selected by the majority of all respondents (>80%). These majority selected NHPs included omega-3 (fish-derived; 83.3%), vitamin D (83.3%), and probiotics (82.1%). These 3 NHPs can be considered as generally accepted interventions in the naturopathic profession, which are highly likely to be encountered in clinical practice by both patients and other health care providers. Perceived contraindications for NHPs do exist and were identified by respondents which would influence interventions in a clinical setting. With regard to the 3 other interventional domains (nutrition, physical medicine, and mental-emotional), the highest selected choice by all respondents included the anti-inflammatory diet, exercise, and meditation, respectively.

Broadly speaking, with regard to the practitioner characteristics in North America (members of the OncANP), half of the NDs surveyed with a focus in cancer care are open to providing pediatric oncology care. Our results show that the primary reason (45.1% of non-treaters) that NDs are not treating pediatric patients with cancer is an absence of public demand. Future research is required to understand the disconnect between the reported high use of CAM by families¹ and patients accessing CAM providers (such as NDs). It is encouraging that there is clear support for the real-world applicability of the program that this survey will help create. The majority of non-treaters (59.7%) report that they require more information about clinical standards (dosing, safety, and clinical data/research), which we plan to expand on and elucidate through the future IPOP.

Comparing the findings of the current survey to our previous work in the context of perioperative care of thoracic cancers provides interesting insight into naturopathic oncology practice. Fish-derived omega-3, vitamin D, probiotics, melatonin, vitamin C, and homeopathic *Arnica* were found in the top 10 most frequently selected NHPs by NDs for both pediatric cancers and thoracic cancers.⁷ For pediatric settings, turmeric/curcumin, glutamine, *Astragalus membranaceus*, and *Coriolus versicolor* were also in the top 10, whereas modified citrus pectin, zinc, whey protein, and a multivitamin/mineral were most common in the thoracic cancer setting.⁷ Recommendations in the remaining domains (physical medicine, mental/emotional, and nutrition interventions) were quite similar in the 2 surveys, with some approaches being recommended more commonly in one context compared with the other. Overall, it seems that there is not a substantial difference between recommendations for

an adult population with thoracic cancer and a pediatric cancer population. Findings from this survey will be utilized, as were the responses of the TPOISE survey, in order to guide an evidence-driven literature search to form a clinical trial within a hospital setting.

Limitations to this work include a relatively small sample size and response rate compared with the number of practicing NDs who treat cancer. Thus, the responses may not effectively represent the recommendations and thoughts of the entire professional body accurately. In order to organize the data collected, open-ended responses were interpreted and categorized into more common terms, which could have led to misinterpretation of what responders actually intended to describe. It is important to note that we only collected what NDs would consider recommending and not how these translate into actual clinical recommendations in practice. Moreover, we created the survey to assess pediatric oncology in general, and it is likely that recommendations may differ based on the primary cancer type, age, health status, and other comorbidities.

Strengths of this work include that we were able to collect information across multiple treatment domains. We reached out to an organization, the OncANP, that represents NDs with the greatest focus on cancer care and thus most likely representative of some of the best naturopathic treatment considerations available for review. In addition, there was an almost even split between those who do and do not treat pediatric cancer cases, allowing us to obtain and compare information from both practitioner populations.

While formal guidelines pertaining to CAM use are limited, survey research from around the globe shows a high prevalence of use in the pediatric oncology population. A 2009 systematic review of 20 studies incorporating 2871 participants found the prevalence of CAM use among pediatric cancer patients ranged from 6% to 91%.¹² The high prevalence of CAM use by pediatric cancer patients and their families, with limited research and clinical guidance of its clinical use, supports the creation of programs, such as IPOP, which will assess safety and efficacy. Results from this survey provide a starting point on which to explore evidence relating to frequently considered and recommended therapies in CAM. A scoping review for the primary recommendations is currently underway by our team.

Conclusion

According to our survey, approximately half of NDs who treat cancer include pediatric cases within their practice. Those who do not treat pediatric cancer patients state that they primarily require more clinical information before they would treat this population. While recommendations varied between responders, there appears to be a few main interventions that are consistently most recommended among the majority of respondents, including both treaters and

non-treaters. There is a need to evaluate the safety and efficacy of the recommendations identified in this survey. Relevant evidence syntheses in this area of pediatric integrative oncology will help develop a safe and evidence-informed hospital-based IPOP.

Declaration of Conflicting Interests

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

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: Support grant from the Children's Hospital of Eastern Ontario (CHEO) Foundation.

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Supplemental Material

Supplemental material for this article is available online.

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