


Naturopathic Oncology Care for Thoracic Cancers: A Practice Survey

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Abstract

Background and Objectives: There is a lack of information on therapies recommended by naturopathic doctors (NDs) for lung and gastroesophageal cancer care. Study objectives were to: (1) identify the most common interventions considered for use by NDs; (2) identify interventions NDs recommend to support key therapeutic goals; and (3) identify potential contraindications between integrative and conventional therapies. **Methods:** Oncology Association of Naturopathic Physicians (OncANP) members (n = 351) were invited to complete an electronic survey. Respondents provided information on interventions considered for thoracic cancer pre- and postoperatively across 4 therapeutic domains (supplemental natural health products, physical, mental/emotional, and nutritional), therapeutic goals, and contraindications. This survey was part of the development of the Thoracic Perioperative Integrative Surgical Evaluation trial. **Results:** Forty-four NDs completed the survey (12.5% response rate), all of whom were trained at accredited colleges in North America and the majority of whom were Fellows of the American Board of Naturopathic Oncology (FABNO) (56.8%). NDs identified significantly more interventions in the postoperative compared to preoperative setting. The most frequently identified interventions included modified citrus pectin, arnica, omega-3 fatty acids, vitamin D, probiotics, exercise, acupuncture, meditation, stress reduction, low glycemic index diet, and Mediterranean diet. Potential contraindications with conventional treatment (surgery, chemotherapy, radiotherapy) differed across natural health products. **Conclusions:** These findings highlight naturopathic interventions with a high level of use in thoracic cancer care, describe and characterize therapeutic goals and the interventions used to achieve these goals, and provide insight on how practice changes relative to conventional cancer treatment phase.

Keywords

naturopathic medicine, naturopathic oncology, integrative oncology, complementary and alternative medicine, lung cancer, gastric cancer, esophageal cancer, surgery, natural health products, nutrition, physical interventions, mental-emotional interventions

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Introduction

More than half of adults diagnosed with cancer worldwide report the use of some form of complementary and alternative medicine (CAM).¹ This demand has prompted research into the safety and efficacy of CAM therapies, driven regulation of CAM practitioners, and contributed to a shift toward “integrative oncology,” whereby CAM is delivered alongside conventional cancer care. While definitions vary, CAM generally encompasses supplemental natural health products (NHPs), physical interventions, mental/emotional/spiritual support, and lifestyle behavior changes (eg, nutritional, physical activity) self-directed by patients or administered by

various health care practitioners including naturopathic doctors (NDs), chiropractors, massage therapists, acupuncturists, and osteopaths.² Research into single-agent therapies and treatments has allowed for more evidence-based CAM recommendations; however, the overall treatment approach

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taken by CAM practitioners across jurisdictions remains poorly understood. This lack of clarity surrounding who is providing care and what recommendations are being made presents a barrier to understanding the scope of integrative oncology and an opportunity for investigation and research.

Within naturopathic medicine, a subdiscipline of naturopathic oncology is growing. A Delphi panel including experts in the field of naturopathic oncology clarified important issues including clinical ethics, philosophy, and research development in this emerging field.³ This process identified goals important to naturopathic oncology, including promoting health-related quality of life (QoL), focusing on whole person care, working with conventional standards of care, and using diet and nutrition therapeutically while maintaining core naturopathic principles.³ Preliminary insight into the therapeutic approaches used by NDs can be inferred from a prospective observational breast cancer outcomes study that described the care provided by ND physicians with expertise in naturopathic oncology practicing in Washington State.⁴ Botanical and mushroom oral therapies, parenteral botanical and nutrient therapy, mind-body medicine, and acupuncture were identified as the most common therapies prescribed. Whether this approach is consistent across NDs practicing in different geographical regions and different cancer types has not been evaluated.

While breast cancer has been at the forefront of CAM use, thoracic cancers present another clear area in which naturopathic oncology may improve outcomes. Patients who undergo curative-intent surgery for thoracic cancers (lung, gastric, and esophageal) face two critical issues: minor and major adverse events in the perioperative period and the risk of recurrence following surgery. Surgery, with its attendant recovery and adverse effects, combined with disease and adjuvant treatment-related side effects, will typically reduce patient QoL. We are embarking on the Thoracic Peri-Operative Integrative Surgical Care Evaluation (T-POISE) trial—designed to evaluate the impact of integrative care delivered by NDs alongside standard care. To help inform the development of the intervention that will be delivered in the T-POISE trial, we surveyed NDs with a focus on cancer care practicing in North America regarding therapies they would recommend for thoracic cancer patients in the pre- and post-operative settings. The objectives of this study are: (1) to identify and enumerate the most common therapeutic recommendations made by NDs for thoracic cancer care; (2) to identify the most common interventions used to support key therapeutic goals; and (3) to identify potential contraindications between integrative and conventional therapies.

Methods

Survey Development and Content

The survey was developed using the FluidSurveys platform (<http://www.fluidsurveys.com>) and consisted of an introductory page that included consent for participation and two main

sections. Section 1 included three items related to education and clinical practice. Section 2 collected information on integrative care recommendations for thoracic cancer care to achieve the broad goals of reduced adverse effects during and after surgery, improved long-term survival, reduced cancer recurrence, and improved QoL. Respondents first identified interventions they would use in the preoperative and/or post-operative settings from a list of options within 4 therapeutic domains (supplemental NHPs, 85 options; physical, 8 options; mental/emotional, 13 options; nutritional, 12 options). Additional open-text fields were available for respondents to enter interventions not available in the lists. Respondents were then asked to provide details for each of the identified therapies in the pre- and postoperative contexts including goals and perceived contraindications. For each of the identified interventions, respondents selected from 10 distinct options to characterize related therapeutic goals (reduce surgical complications [preoperative only], enhance wound healing [preoperative only], antineoplastic, reduce pain, reduce anxiety, increase cardiopulmonary fitness, decrease inflammation, augment immune function, enhance health-related QoL, enhance nutrition). Finally, respondents were asked whether each of the therapies were contraindicated in the 7 days preceding surgery or alongside chemotherapy and radiotherapy. The survey took between 20 and 60 minutes to complete depending on the number of recommendations provided by the respondent. The survey was pretested by a panel of 8 NDs with clinical knowledge and expertise in naturopathic oncology (see Supplemental Content for the list of expert panel members). Their feedback was used to revise the survey structure, the wording used for each question, and response options. Ethics approval was provided by the Canadian College of Naturopathic Medicine and the Ottawa Health ScienceNetworkResearchEthicsBoard,20170620140557817.

Study Sample

The study sample included members of the Oncology Association of Naturopathic Physicians (OncANP), a professional association of NDs from North American naturopathic teaching colleges and universities accredited by the Council of Naturopathic Medical Education, who care for people living with cancer (<https://www.oncanp.org/>). An email link to the self-administered online questionnaire was sent to 351 members who were currently in practice (student members were excluded). At least 3 attempts were made to contact each potential participant. To encourage survey participation, respondents were offered the chance to enter into a draw for 1 of 3 prizes ranging from CAD\$200 to CAD\$600.

Data Analysis

Survey data were exported into Microsoft Excel 2010 (Microsoft Office, Redmond, WA) for analysis. Results are presented descriptively (means \pm standard error of mean,

Table 1. Respondent Characteristics (n = 44).

	Count (%)
OncANP membership status ^a	
FABNOs	25 (56.8)
Associates	19 (43.2)
Years of clinical practice	
1-5 years	10 (22.7)
6-10 years	14 (31.8)
11-15 years	11 (25.0)
16-20 years	1 (2.3)
>20 years	8 (18.2)
Country of practice	
Canada	16 (36.4)
United States	28 (63.6)
Educational institution	
Canadian College of Naturopathic Medicine (Canada)	13 (29.5)
National College of Natural Medicine (USA)	12 (27.3)
Bastyr University (USA)	9 (20.5)
Southwest College of Naturopathic Medicine (USA)	6 (13.6)
Boucher Institute of Naturopathic Medicine (Canada)	3 (6.8)
University of Bridgeport (USA)	1 (2.3)

Abbreviations: OncANP, Oncology Association of Naturopathic Physicians; FABNO, Fellow of the American Board of Naturopathic Oncology.

^aThe invitation list was 26.2% FABNO and 73.8% Associate.

counts, and percentages). Two-tailed, independent-sample Student's *t* tests were used to compare between the pre- and postoperative settings with α set at a more stringent statistical significance level of 0.01 to account for multiple comparisons. We restricted the analysis and discussion for therapeutic goal-intervention pairings and for contraindications to those that were identified by at least 20% of survey respondents.

Results

Sample Characteristics

A total of 44 NDs completed the survey between May and July 2015. The overall response rate was 12.5%. Fifty-seven percent of respondents were Fellows of the American Board of Naturopathic Oncology (FABNO). All respondents practice in North America (United States of America and Canada) with the majority having trained and currently practicing in the United States of America. There was a range of clinical experience identified by survey respondents with practice duration between 6 and 10 years being the most frequent. Detailed respondent characteristics are summarized in Table 1.

Integrative Therapies

NDs identified significantly more integrative interventions in the postoperative (26.7 ± 2.5) compared to preoperative (17.7 ± 1.9) setting ($P < .01$). When considering each domain separately, more postoperative interventions were identified within the supplemental (17.9 ± 1.7 vs 10.6 ± 1.3 ; $P < .001$) and physical (2.5 ± 0.3 vs 1.5 ± 0.2 ; $P < .01$) domains compared to preoperative interventions, whereas the number of recommendations identified did not differ significantly within the mental/emotional (preoperative and postoperative: 3.5 ± 0.4) and nutritional domains (preoperative: 2.2 ± 0.3 ; postoperative: 2.8 ± 0.3).

The 10 most frequently recommended NHPs preoperatively included modified citrus pectin (MCP; 77.3%), vitamin D (59.1%), arnica (54.5%), probiotics (54.5%), omega-3 fatty acids (fish oil; 52.3%), zinc (50.0%), oral vitamin C (40.9%), melatonin (38.6%), whey protein (38.6%), and multimineral/vitamin (31.8%). Postoperatively, the 11 most frequently recommended NHPs included arnica (77.3%), omega-3 fatty acids (fish oil; 72.7%), MCP (70.5%), probiotics (63.6%), vitamin D (63.6%), turmeric (curcumin; 61.4%), oral vitamin C (59.1%), zinc (56.8%), melatonin (52.3%), whey protein (50.0%), and bromelain (50.0%). The most highly recommended physical interventions included exercise (preoperative: 59.1%; postoperative: 65.6%), acupuncture (preoperative: 36.4%; postoperative: 70.5%), and massage (preoperative: 18.2%; postoperative: 31.8%). The 5 most commonly identified mental/emotional interventions included meditation (preoperative: 59.1%; postoperative: 56.8%), stress reduction (preoperative: 54.5%; postoperative: 54.5%), diaphragmatic breathing (preoperative: 43.2%; postoperative: 45.5%), visualization (preoperative: 43.2%; postoperative: 36.4%), and yoga (preoperative: 29.5%; postoperative: 36.4%). The most highly recommended nutritional approaches included low glycemic (preoperative and postoperative: 50.0%), Mediterranean (preoperative: 45.5%; postoperative: 52.3%) and anti-inflammatory (preoperative: 38.6%; postoperative: 61.4%). The results for all interventions identified by at least one respondent are summarized in Table 2.

Four of the responses added in the open-text fields, each by only one respondent (2.3%), were not included in Table 2 as they were difficult to categorize into 1 of the 4 domains. The nonlisted additions are low-dose naltrexone, cannabidiol and rehabilitation recommended in both the pre- and postoperative periods, and neural therapy recommended in the postoperative period.

Therapeutic Goals

Results are presented and described in Table 3 according to the predefined intervention-therapeutic goal pairings that were identified by at least 20% of respondents. For each of

Table 2. Interventions Considered for Use by Naturopathic Doctors in the Preoperative and Postoperative Care of Patients With Thoracic Cancer.

Intervention	Preoperative Recommendation, Count (%)	Postoperative Recommendation, Count (%)
<i>Supplemental domain</i>		
Modified citrus pectin (PectaSol C)	34 (77.3)	31 (70.5)
Vitamin D (vitamin D ₃)	26 (59.1)	28 (63.6)
Arnica	24 (54.5)	34 (77.3)
Probiotics	24 (54.5)	28 (63.6)
Omega-3 fatty acid (fish oil)	23 (52.3)	32 (72.7)
Zinc	22 (50.0)	25 (56.8)
Vitamin C (ascorbic acid)—oral	18 (40.9)	26 (59.1)
Melatonin	17 (38.6)	23 (52.3)
Whey protein	17 (38.6)	22 (50.0)
Multimineral/multivitamin	14 (31.8)	14 (31.8)
Vitamin C (ascorbic acid)—intravenous	13 (29.5)	18 (40.9)
Antioxidant vitamins (eg, ACEs)	12 (27.3)	16 (36.4)
Turmeric (curcumin)	12 (27.3)	27 (61.4)
Glutamine	11 (25)	17 (38.6)
Coriolus versicolor	10 (22.7)	19 (43.2)
L-theanine	9 (20.5)	10 (22.7)
Mistletoe—subcutaneous injections	9 (20.5)	13 (29.5)
Vitamin A (retinol)	8 (18.2)	10 (22.7)
Astragalus	7 (15.9)	18 (40.9)
Green tea (epigallocatechin gallate [EGCG] extract)	7 (15.9)	18 (40.9)
Maitake	7 (15.9)	10 (22.7)
Hypericum	6 (13.6)	12 (27.3)
Vitamin B complex	6 (13.6)	11 (25)
Anthocyanins	5 (11.4)	7 (15.9)
Ashwagandha	5 (11.4)	9 (20.5)
Bromelain	5 (11.4)	22 (50.0)
Flaxseed (ground)	5 (11.4)	8 (18.2)
Quercetin	5 (11.4)	12 (27.3)
Vitamin B ₁₂	5 (11.4)	7 (15.9)
N-acetyl cysteine	5 (11.4)	11 (25)
Coenzyme Q10	4 (9.1)	13 (29.5)
Selenium	4 (9.1)	5 (11.4)
Vitamin E—oral	4 (9.1)	7 (15.9)
Active hexose correlated compound (AHCC)	3 (6.8)	8 (18.2)
Alpha lipoic acid	3 (6.8)	8 (18.2)
American ginseng (<i>Panax quinquefolius</i>)	3 (6.8)	8 (18.2)
Berberine	3 (6.8)	7 (15.9)
<i>Boswellia serrata</i> (Frankincense)	3 (6.8)	15 (34.1)
Fermented wheat germ extract	3 (6.8)	8 (18.2)
Ginger	3 (6.8)	5 (11.4)
Grape seed	3 (6.8)	3 (6.8)
Honokiol	3 (6.8)	4 (9.1)
Magnesium	3 (6.8)	9 (20.5)
Milk thistle (silymarin extract)	3 (6.8)	9 (20.5)
Mistletoe—intravenous	3 (6.8)	4 (9.1)
Reishi gano	3 (6.8)	5 (11.4)
Resveratrol	3 (6.8)	6 (13.6)
Vitamin E—topical	3 (6.8)	9 (20.5)
Vitamin B ₉ (folic acid)	3 (6.8)	2 (4.5)

(continued)

Table 2. (continued)

Intervention	Preoperative Recommendation, Count (%)	Postoperative Recommendation, Count (%)
Asian/Korean ginseng (<i>Panax ginseng</i>)	2 (4.5)	4 (9.1)
Calcium/magnesium	2 (4.5)	4 (9.1)
Lactoferrin	2 (4.5)	3 (6.8)
Vitamin K	2 (4.5)	3 (6.8)
Traumeel	2 (4.5)	2 (4.5)
L-arginine*	2 (4.5)	0 (0)
Acetyl L-carnitine	1 (2.3)	12 (27.3)
Benfotiamine (vitamin B ₁ derivative)	1 (2.3)	4 (9.1)
Calendula	1 (2.3)	14 (31.8)
Eleuthero	1 (2.3)	6 (13.6)
Indole-3-carbinol (I3C)	1 (2.3)	1 (2.3)
Inositol hexaphosphate (IP6)	1 (2.3)	1 (2.3)
Licorice root	1 (2.3)	5 (11.4)
Lysine	1 (2.3)	2 (4.5)
Red clover	1 (2.3)	2 (4.5)
Siberian ginseng	1 (2.3)	3 (6.8)
L-carnitine ^a	1 (2.3)	2 (4.5)
Vitamin B ₃ (niacin)	1 (2.3)	1 (2.3)
Arabinogalactan ^a	1 (2.3)	1 (2.3)
L-cysteine ^a	1 (2.3)	1 (2.3)
Slippery elm ^a	1 (2.3)	1 (2.3)
Yunnanbaiyao ^a	1 (2.3)	1 (2.3)
Medium-chain triglyceride (MCT) oil ^a	1 (2.3)	1 (2.3)
Lavender ^a	1 (2.3)	0 (0)
Phosphorous (homeopathic) ^a	1 (2.3)	1 (2.3)
Gelsemium (homeopathic) ^a	1 (2.3)	1 (2.3)
Thiosinaminum (homeopathic) ^a	1 (2.3)	0 (0)
Aloe vera	0 (0)	6 (13.6)
Artemisinin—oral	0 (0)	2 (4.5)
<i>Ricinus communis</i> (castor) oil ^a	0 (0)	2 (4.5)
Proteolytic enzyme ^a	0 (0)	2 (4.5)
Artesunate—intravenous	0 (0)	3 (6.8)
Astaxanthin (keto-carotenoid)	0 (0)	2 (4.5)
Black cohosh	0 (0)	2 (4.5)
Diindolylmethane (DIM)	0 (0)	2 (4.5)
Feverfew	0 (0)	2 (4.5)
Flaxseed oil	0 (0)	4 (9.1)
Garlic	0 (0)	5 (11.4)
Horse chestnut	0 (0)	1 (2.3)
S-acetyl glutathione	0 (0)	1 (2.3)
Glutathione (nebulized) ^a	0 (0)	1 (2.3)
N-acetyl cysteine (nebulized) ^a	0 (0)	1 (2.3)
<i>Physical domain</i>		
Exercise	26 (59.1)	29 (65.9)
Acupuncture	16 (36.4)	31 (70.5)
Massage	8 (18.2)	14 (31.8)
Physiotherapy	4 (9.1)	13 (29.5)
Craniosacral therapy	4 (9.1)	5 (11.4)
Myofascial release	3 (6.8)	9 (20.5)
Chiropractic	2 (4.5)	5 (11.4)
Reflexology	1 (2.3)	1 (2.3)

(continued)

Table 2. (continued)

Intervention	Preoperative Recommendation, Count (%)	Postoperative Recommendation, Count (%)
Occupational therapy ^a	1 (2.3)	1 (2.3)
Low level laser therapy ^a	0 (0)	1 (2.3)
Prolozone ^a	0 (0)	1 (2.3)
<i>Mental/emotional domain</i>		
Meditation	26 (59.1)	25 (56.8)
Stress reduction	24 (54.5)	24 (54.5)
Diaphragmatic breathing	19 (43.2)	20 (45.5)
Visualization	19 (43.2)	16 (36.4)
Yoga	13 (29.5)	16 (36.4)
Progressive muscle relaxation	13 (29.5)	12 (27.3)
Reiki	10 (22.7)	11 (25.0)
Cognitive behavioral therapy	9 (20.5)	10 (22.7)
Psychotherapy	8 (18.2)	8 (18.2)
Biofeedback	5 (11.4)	5 (11.4)
Therapeutic touch	3 (6.8)	4 (9.1)
Hypnotherapy (hypnosis)	1 (2.3)	1 (2.3)
Qi gong ^a	1 (2.3)	1 (2.3)
Pranic healing ^a	1 (2.3)	1 (2.3)
Cranial electrotherapy stimulation ^a	1 (2.3)	0 (0)
<i>Nutritional domain</i>		
Low glycemic	22 (50.0)	22 (50.0)
Mediterranean	20 (45.5)	23 (52.3)
Anti-inflammatory	17 (38.6)	27 (61.4)
Paleolithic	8 (18.2)	8 (18.2)
Detoxification	5 (11.4)	11 (25.0)
Ketogenic	6 (13.6)	7 (15.9)
Intermittent fasting	4 (9.1)	7 (15.9)
Vegetarian	4 (9.1)	7 (15.9)
Caloric restriction	4 (9.1)	5 (11.4)
Macrobiotic	3 (6.8)	3 (6.8)
Vegan	2 (4.5)	1 (2.3)
Low sodium ^a	1 (2.3)	0 (0)
Caloric restriction ^a	0 (0)	1 (2.3)

^aRecommendation was written in an open-text field, not identified from the list of options in the survey.

Table 3. Pairings of Therapeutic Goals and Interventions in Preoperative and Postoperative Thoracic Cancer Care Identified by Over 20% of Naturopathic Doctors.

	Preoperative, Count (%)	Postoperative, Count (%)
<i>Reduce surgical complications</i>		
Probiotics	18 (40.9)	a
Arnica	17 (38.6)	a
Exercise	17 (38.6)	a
Omega-3 fatty acid (fish oil)	13 (29.5)	a
Meditation	12 (27.3)	a
Antioxidant vitamins (eg, ACEs)	10 (22.7)	a
Acupuncture	9 (20.5)	a
Diaphragmatic breathing	9 (20.5)	a
Visualization	9 (20.5)	a
Anti-inflammatory diet	9 (20.5)	a

(continued)

Table 3. (continued)

	Preoperative, Count (%)	Postoperative, Count (%)
<i>Enhance wound healing</i>		
Arnica	20 (45.5)	a
Exercise	13 (29.5)	a
Omega-3 fatty acid (fish oil)	12 (27.3)	a
Anti-inflammatory diet	12 (27.3)	a
Antioxidant vitamins (eg, ACEs)	11 (25)	a
Glutamine	10 (22.7)	a
Zinc	10 (22.7)	a
Vitamin C—oral	9 (20.5)	a
Acupuncture	9 (20.5)	a
Meditation	9 (20.5)	a
<i>Antineoplastic</i>		
Modified citrus pectin (PectaSol C)	29 (65.9)	26 (59.1)
Exercise	16 (36.4)	15 (34.1)
Melatonin	14 (31.8)	21 (47.7)
Turmeric (curcumin)	11 (25)	23 (52.3)
Low glycemic diet	9 (20.5)	12 (27.3)
Green tea (epigallocatechin gallate (EGCG) extract)	— ^b	17 (38.6)
<i>Coriolus versicolor</i>	—	14 (31.8)
Omega-3 fatty acid (fish oil)	—	12 (27.3)
Anti-inflammatory diet	—	10 (22.7)
<i>Boswellia serrata</i> (Frankincense)	—	9 (20.5)
Mistletoe—subcutaneous injections	—	9 (20.5)
<i>Reduce pain</i>		
Meditation	20 (45.5)	18 (40.9)
Arnica	19 (43.2)	28 (63.6)
Exercise	15 (34.1)	20 (45.5)
Diaphragmatic breathing	14 (31.8)	13 (29.5)
Stress reduction	14 (31.8)	13 (29.5)
Acupuncture	11 (25)	29 (65.9)
Visualization	11 (25)	11 (25)
Anti-inflammatory diet	10 (22.7)	15 (34.1)
Omega-3 fatty acid (fish oil)	9 (20.5)	19 (43.2)
Turmeric (curcumin)	—	16 (36.4)
Bromelain	—	13 (29.5)
Yoga	—	13 (29.5)
Physiotherapy	—	12 (27.3)
Hypericum	—	11 (25)
Massage	—	11 (25)
Myofascial release	—	9 (20.5)
<i>Reduce anxiety</i>		
	Count (%)	Count (%)
Meditation	25 (56.8)	24 (54.5)
Stress reduction	23 (52.3)	22 (50)
Exercise	21 (47.7)	26 (59.1)
Diaphragmatic breathing	18 (40.9)	18 (40.9)
Visualization	18 (40.9)	15 (34.1)
Acupuncture	15 (34.1)	25 (56.8)
Progressive muscle relaxation	13 (29.5)	12 (27.3)
Yoga	11 (25)	14 (31.8)

(continued)

Table 3. (continued)

	Preoperative, Count (%)	Postoperative, Count (%)
L-theanine	9 (20.5)	—
Reiki	9 (20.5)	10 (22.7)
Massage	—	11 (25)
Omega-3 fatty acid (fish oil)	—	10 (22.7)
<i>Increase cardiopulmonary fitness</i>		
Exercise	25 (56.8)	25 (56.8)
Omega-3 fatty acid (fish oil)	10 (22.7)	15 (34.1)
Coenzyme Q10	—	9 (20.5)
Yoga	—	9 (20.5)
<i>Decrease inflammation</i>		
Omega-3 fatty acid (fish oil)	22 (50)	30 (68.2)
Arnica	17 (38.6)	23 (52.3)
Exercise	17 (38.6)	16 (36.4)
Low glycemic index diet	16 (36.4)	13 (29.5)
Mediterranean diet	16 (36.4)	13 (29.5)
Anti-inflammatory diet	15 (34.1)	23 (52.3)
Turmeric (curcumin)	11 (25.0)	25 (56.8)
Meditation	9 (20.5)	11 (25)
Acupuncture	—	21 (47.7)
Bromelain	—	18 (40.9)
<i>Boswellia serrata</i> (Frankincense)	—	12 (27.3)
Probiotics	—	10 (22.7)
Antioxidant vitamins (eg, ACEs)	—	9 (20.5)
Quercetin	—	9 (20.5)
<i>Augment immune function</i>		
Exercise	22 (50)	23 (52.3)
Probiotics	18 (40.9)	20 (45.5)
Meditation	15 (34.1)	13 (29.5)
Melatonin	13 (29.5)	17 (38.6)
Stress reduction	13 (29.5)	16 (36.4)
Modified citrus pectin (PectaSol C)	12 (27.3)	12 (27.3)
Acupuncture	12 (27.3)	15 (34.1)
Vitamin D (vitamin D ₃)	11 (25)	13 (29.5)
<i>Coriolus versicolor</i>	10 (22.7)	17 (38.6)
Omega-3 fatty acid (fish oil)	9 (20.5)	12 (27.3)
Zinc	9 (20.5)	13 (29.5)
Astragalus	—	15 (34.1)
Turmeric (curcumin)	—	12 (27.3)
Anti-inflammatory diet	—	12 (27.3)
Antioxidant vitamins (eg, ACEs)	—	11 (25)
Vitamin C—oral	—	11 (25)
Mistletoe—subcutaneous injections	—	10 (22.7)
Visualization	—	9 (20.5)
<i>Enhance health-related QoL</i>		
Exercise	25 (56.8)	26 (59.1)
Meditation	19 (43.2)	20 (45.5)
Stress reduction	18 (40.9)	18 (40.9)
Diaphragmatic breathing	15 (34.1)	14 (31.8)
Probiotics	14 (31.8)	18 (40.9)
Visualization	14 (31.8)	13 (29.5)

(continued)

Table 3. (continued)

	Preoperative, Count (%)	Postoperative, Count (%)
Melatonin	12 (27.3)	12 (27.3)
Omega-3 fatty acid (fish oil)	12 (27.3)	19 (43.2)
Anti-inflammatory diet	11 (25)	18 (40.9)
Acupuncture	10 (22.7)	26 (59.1)
Yoga	10 (22.7)	13 (29.5)
Low glycemic diet	10 (22.7)	12 (27.3)
Mediterranean diet	10 (22.7)	13 (29.5)
Turmeric (curcumin)	—	16 (36.4)
Antioxidant vitamins (eg, ACEs)	—	10 (22.7)
Arnica	—	10 (22.7)
Zinc	—	10 (22.7)
Massage	—	10 (22.7)
Vitamin C—oral	—	9 (20.5)
Whey protein	—	9 (20.5)
Physiotherapy	—	9 (20.5)
Detoxification	—	9 (20.5)
<i>Enhance nutrition</i>		
Mediterranean diet	17 (38.6)	21 (47.7)
Anti-inflammatory diet	15 (34.1)	23 (52.3)
Low glycemic diet	15 (34.1)	13 (29.5)
Omega-3 fatty acid (fish oil)	13 (29.5)	22 (50)
Probiotics	12 (27.3)	14 (31.8)
Multimineral/multivitamin	11 (25)	14 (31.8)
Whey protein	—	12 (27.3)
Antioxidant vitamins (eg, ACEs)	—	11 (25)
Zinc	—	11 (25)
Vitamin C—oral	—	10 (22.7)
Glutamine	—	9 (20.5)

Abbreviations: ACE, angiotensin-converting enzyme; QoL, quality of life.

^aNot included as response option in postoperative setting.

^bDashes indicate that <20% of respondents identified this pairing.

the 10 predefined goals, between 4 and 22 interventions were identified. Nine interventions were identified as meeting at least 5 therapeutic goals: omega-3 fatty acids (fish oil; 10 goals), exercise (9 goals), anti-inflammatory diet (8 goals), meditation (7 goals), acupuncture (7 goals), probiotics (5 goals), arnica (5 goals), visualization (5 goals), and turmeric (curcumin; 5 goals). The majority of goals were targeted by interventions in each of the four domains with the exception of antineoplastic (no mental/emotional interventions), reduce anxiety and increase cardiopulmonary fitness (no nutritional interventions), and enhance nutrition (no physical or mental/emotional interventions). Table 4 shows the average number of interventions identified to support each therapeutic goal.

Contraindications

Table 5 summarizes perceived contraindications with conventional therapies reported for supplemental interventions

identified by at least 20% of NDs in the preoperative and/or postoperative settings. Four supplements were reported as contraindicated in the 7 days preceding surgery by at least half of the respondents (omega-3 fatty acids [fish oil], bromelain, *Boswellia serrata* [frankincense], and antioxidant vitamins). Contraindications were identified by over half of NDs for turmeric (curcumin) and N-acetyl cysteine during chemotherapy and with N-acetyl cysteine, antioxidant vitamins, coenzyme Q10, green tea (epigallocatechin gallate [EGCG] extract) and intravenous vitamin C during radiotherapy. All other contraindications in the supplemental, physical, mental/emotional, and nutritional domains were identified by less than 50% of respondents.

Discussion

This report provides an important step toward a clearer understanding of the therapies and clinical focus used in naturopathic oncology, namely, what NDs are and are not

Table 4. Number of Interventions Identified by Therapeutic Goal.

Goals	Average Number of Interventions Identified (Mean ± SEM)				All Domains
	Supplemental	Physical	Mental/Emotional	Nutritional	
<i>Preoperative setting</i>					
Enhance health-related quality of life	3.3 ± 0.5	1.1 ± 0.2	2.4 ± 0.3	1.0 ± 0.3	7.9 ± 1.0
Augment immune function	4.1 ± 0.4	0.8 ± 0.1	1.5 ± 0.3	0.8 ± 0.2	7.2 ± 0.7
Decrease inflammation	2.9 ± 0.4	0.7 ± 0.1	0.8 ± 0.2	1.6 ± 0.3	6.0 ± 0.8
Reduces surgical complications	3.3 ± 0.5	0.7 ± 0.1	1.3 ± 0.3	0.8 ± 0.2	6.0 ± 0.8
Reduce anxiety	1.2 ± 0.2	1.2 ± 0.2	3.2 ± 0.4	0.4 ± 0.1	5.9 ± 0.7
Enhance wound healing	3.4 ± 0.4	0.6 ± 0.1	1.0 ± 0.2	0.8 ± 0.2	5.8 ± 0.6
Reduce pain	1.7 ± 0.3	1.1 ± 0.2	2.3 ± 0.4	0.5 ± 0.1	5.5 ± 0.7
Antineoplastic	3.1 ± 0.5	0.4 ± 0.1	0.3 ± 0.1	1.0 ± 0.3	4.7 ± 0.7
Enhance nutrition	2.6 ± 0.4	0.1 ± 0.0	0.3 ± 0.1	1.5 ± 0.2	4.4 ± 0.6
Increase cardiopulmonary fitness	0.9 ± 0.3	0.7 ± 0.1	0.5 ± 0.2	0.5 ± 0.1	2.6 ± 0.5
<i>Average for preoperative setting</i>	10.6 ± 1.3	1.5 ± 0.3	3.5 ± 0.4	2.2 ± 0.3	17.7 ± 1.9
<i>Postoperative setting</i>					
Enhance health-related quality of life	6.4 ± 0.8	2.0 ± 0.2	2.6 ± 0.4	1.6 ± 0.3	12.6 ± 1.4
Augment immune function	6.2 ± 0.7	1.0 ± 0.2	1.7 ± 0.4	1.1 ± 0.3	10.1 ± 1.2
Decrease inflammation	5.9 ± 0.6	1.3 ± 0.2	1.0 ± 0.3	1.9 ± 0.3	10.1 ± 1.1
Reduce pain	4.2 ± 0.5	2.2 ± 0.3	2.5 ± 0.4	0.9 ± 0.2	9.8 ± 1.1
Antineoplastic	5.9 ± 0.7	0.4 ± 0.1	0.3 ± 0.1	1.3 ± 0.3	8.0 ± 0.9
Reduce anxiety	1.5 ± 0.4	1.8 ± 0.2	3.3 ± 0.4	0.5 ± 0.2	7.1 ± 1.0
Enhance nutrition	4.1 ± 0.6	0.1 ± 0.1	0.2 ± 0.1	1.9 ± 0.3	6.3 ± 0.8
Increase cardiopulmonary fitness	1.5 ± 0.4	0.8 ± 0.1	1.0 ± 0.3	0.5 ± 0.2	3.8 ± 0.8
<i>Average for postoperative setting</i>	17.9 ± 1.7	2.5 ± 0.3	3.5 ± 0.4	2.8 ± 0.3	26.7 ± 2.5

Table 5. Reported Supplemental Intervention Contraindications With Conventional Therapies.

Intervention ^a	Number Surveyed ^b	Contraindicated (%)		
		7 Days Preoperative	Chemotherapy	Radiotherapy
Acetyl L-carnitine	12	0.0	33.3	25.0
Alpha lipoic acid	9	11.1	44.4	44.4
Antioxidant vitamins (eg, ACEs)	18	50.0	33.3	66.7
Arnica	36	2.8	0.0	0.0
Ashwagandha	9	11.1	0.0	11.1
Astragalus	18	0.0	0.0	25.0
<i>Boswellia serrata</i> (Frankincense)	15	53.3	40.0	20.0
Bromelain	22	54.5	9.1	9.1
Calendula	14	0.0	0.0	0.0
Coenzyme Q10	13	7.7	7.7	53.8
<i>Coriolus versicolor</i>	19	10.5	10.5	10.5
Flaxseed (ground)	9	0.0	0.0	0.0
Glutamine	19	5.3	10.5	10.5
Green tea (epigallocatechin gallate [EGCG] extract)	19	31.6	47.4	52.6
Hypericum	12	0.0	8.3	8.3
L-theanine	13	0.0	7.7	7.7
Magnesium	9	9.1	0.0	0.0
Maitake	11	8.7	4.3	8.7
Melatonin	23	8.7	4.3	8.7
Milk thistle (silymarin extract)	9	11.1	22.2	11.1

(continued)

Table 5. (continued)

Intervention ^a	Number Surveyed ^b	Contraindicated (%)		
		7 Days Preoperative	Chemotherapy	Radiotherapy
Mistletoe—subcutaneous injections	13	0.0	7.7	7.7
Modified citrus pectin (PectaSol C)	36	8.3	2.8	2.8
Multimineral/multivitamin	16	25.0	18.8	12.5
N-acetyl cysteine	10	0.0	60.0	70.0
Omega-3 fatty acid (fish oil)	32	56.3	18.8	12.5
Probiotics	30	3.3	6.7	0.0
Quercetin	12	8.3	33.3	25.0
Turmeric (curcumin)	27	37.0	63.0	18.5
Vitamin A (retinol)	13	15.4	7.7	7.7
Vitamin B complex	11	0.0	18.2	0.0
Vitamin C—intravenous	10	10.0	20.0	50.0
Vitamin C—oral	19	36.8	21.1	31.6
Vitamin D	18	5.6	0.0	0.0
Whey protein	15	6.7	6.7	6.7
Zinc	22	13.6	0.0	4.5

Abbreviation: ACE, angiotensin-converting enzyme.

^aData presented for supplements identified by at least 20% of survey respondents.

^bReflects number of respondents who identified supplement intervention in the preoperative and/or postoperative settings.

recommending and the therapeutic goals targeted by their recommended interventions. This survey highlights naturopathic interventions spanning four holistic domains that have a high level of practical usage in thoracic cancer care in both preoperative and postoperative settings. The findings describe and characterize therapeutic goals, their relative importance as determined by NDs focused on cancer care, and the most common interventions used to achieve these therapeutic goals. Furthermore, the results describe how practice changes relative to conventional cancer treatment (ie, preoperative vs postoperative setting, contraindications with chemotherapy and radiotherapy). With such a broad scope of practice by NDs these findings are useful to better understand the clinical focus and indirectly the weight of value placed on different therapies. These findings also identify important considerations for further research where evidence gaps exist.

NDs report a holistic approach to thoracic cancer care and consider recommendations across supplemental, physical, mental/emotional, and nutritional domains. Results indicate that NDs are more conservative in making recommendations in the physical and supplemental domains in the preoperative period compared with the postoperative period. While NDs consider a limited number of distinct interventions within the physical, mental/emotional, and nutritional therapeutic domains (1.5-3.5 interventions per domain), they consider a relatively high number of distinct supplemental NHP interventions (preoperative: 10.6; postoperative: 17.9).

The holistic approach reported by NDs is also reflected by the use of interventions that target the full range of key therapeutic goals identified by the expert panel who contributed to the survey development (see Supplemental content). NDs identified a number of interventions across domains that they consider as multitargeted. For example, fish oil, exercise, anti-inflammatory diet, and meditation were each reported to be used for 7 or more therapeutic goals by at least 20% of respondents. Moreover, the findings suggest that NDs report a range of intervention options to target each therapeutic goal. Overall, the most frequently identified therapeutic goals targeted by naturopathic interventions include: (1) enhance health-related QoL, (2) augment immune function, and (3) decrease inflammation.

An important finding is the relatively high level of variability in responses in relation to perceived contraindications with conventional therapies (surgery, chemotherapy, and radiotherapy). None of the contraindications identified showed a high degree of consensus; the most important contraindication was ascribed to N-acetyl cysteine use with radiotherapy, identified by 7 of 10 queried. Furthermore, of the 105 queries for interactions presented in Table 5 (35 NHPs with 3 conventional treatment types [surgery, chemotherapy, and radiation]), 67% of the responses fall between 0.1% and 49%, suggesting large differences in practice for at least a fraction of NDs. Several survey design factors may have contributed to the heterogeneity in responses. First, the survey did not distinguish between absolute and relative contraindications. Second, the survey did not differentiate

between different chemotherapeutic agents. The differing pharmacokinetic and pharmacodynamic properties of chemotherapeutic drugs influence the potential for NHPs to interact. Third, the survey did not specify dosing of NHPs, which determines the potential for physiological effect and for interaction with other treatments. Finally, the number surveyed was generally low as only those who identified the intervention were asked for detail about contraindications, further reducing our sample size. Nonetheless, this finding points to an area where greater research and knowledge translation is warranted.

Overall, there was a low response rate for this survey increasing the likelihood that our sample is not a representative sample of overall ND practice. Indeed, the response rates were 27% and 7%, respectively, for FABNO and associate members. This suggests that our study sample has more training and experience in oncology care as the FABNO designation indicates that the clinician has completed the oncology board certification process through the American Board of Naturopathic Oncology (ABNO). The process requires the clinician to obtain a minimum amount of oncology training either through an oncology residency or five years of oncology-focused clinical practice, engage in oncology research, pass the ABNO board examination, and obtain continuing medical education credits in oncology. Despite the limited number of NDs, respondents came from a diversity of states in the United States and provinces across Canada, and there is representation from graduates of 6 of the 7 accredited colleges. This diversity does provide broader generalizability to North American practice at least as ascribed to NDs who have a focus in naturopathic oncology.

We have identified the broad range of interventions that NDs would *consider* in the care of thoracic cancer patients both before and after surgery; however, additional work is needed to better characterize how these considerations translate to actual recommendations in clinical practice. Respondents were not asked about the clinical situations that would cause them to adopt a consideration as an actual recommendation nor which therapies would be used as first- or second-line treatments. The survey also does not capture the manner in which considerations are translated to recommendations nor the time spent with patients to help them adopt them if made. Moreover, this survey only reflects on the practitioner's perspective without inclusion of the patient's desires or aptitude to adopt recommendations. Therefore, these findings do not provide clarity on the absolute number or even range of recommendations that might be provided to a patient or under what circumstances this might change.

We acknowledge a number of factors that may have influenced how NDs responded to the survey and which may have biased the findings. First, it is impossible to remove the potential effect that the survey development and presentation may have had on the responses provided. The structure of the survey itself and its presentation may have

led some of the respondents to emphasize certain areas over others. As noted, the survey did not distinguish absolute from relative contraindications, which may have caused over- or underreporting for some respondents. Finally, as this is a representation of NDs across multiple jurisdictions with differing scopes of practice, variations in scope of practice based on regulatory limitations may have introduced additional bias.

An important consideration when interpreting these findings is that frequent identification of interventions does not necessarily indicate that there is evidence for efficacy but rather a high level of practical usage. However, many of the most commonly identified interventions have been the focus of systematic reviews and meta-analyses evaluating their impact on various cancer-related outcomes.⁵⁻¹⁵ This suggests that an evidence base exists. The next step of the Thoracic POISE project is to perform an evidence review to identify the interventions with high level of both practical usage and evidence of benefit and safety from clinical research in the literature. In summary, NDs report having a wide range of options at their disposal to support broad therapeutic goals in thoracic cancer patients; more work is needed to better understand the actual prescribing practices and the evidence that exists for these therapies.

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Supplemental Material

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