


Breast Cancer Integrative Oncology Care and Its Costs

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Abstract

Background. Naturopathic oncology in conjunction with conventional treatment is commonly referred to as integrative oncology (IO). Clinics directed by oncology board certified NDs (Fellows of the American Board of Naturopathic Oncology or FABNOs) provide high-quality data for describing IO therapies, their costs and measuring clinical outcomes. **Purpose.** To describe the types of IO therapies prescribed to breast cancer patients by ND FABNO physicians. **Study participants** (n = 324). Women who sought care at 1 of 6 naturopathic oncology clinics in Washington State were asked to enroll in a prospective 5 year observational outcomes study. **Methods.** Medical records were abstracted to collect treatment recommendations and cost data. **Results.** More than 72 oral or topical, nutritional, botanical, fungal and bacterial-based medicines were prescribed to the cohort during their first year of IO care. Trametes versicolor was prescribed to 63% of the women. Mind-body therapy was recommended to 45% of patients, and 49% received acupuncture. Also, 26% were prescribed injectable therapy, including mistletoe, vitamin B complex (12%), IV ascorbate (12%), IV artesunate (7%), and IV nutrition and hydration (4%). Costs ranged from \$1594/year for early-stage breast cancer to \$6200/year for stage 4 breast cancer patients. Of the total amount billed for IO care for 1 year for breast cancer patients, 21% was out-of-pocket. **Conclusions.** IO care for women with breast cancer consists of botanical and mushroom oral therapies, parenteral botanical and nutrient therapy, mind-body medicine and acupuncture. IO clinic visits and acupuncture are partially paid for by medical insurance companies.

Keywords

breast cancer, integrative oncology care, community oncology care, costs, naturopathic medicine

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Introduction

More and more people diagnosed with cancer are choosing to supplement their conventional oncology treatment with complementary care provided by licensed complementary and alternative medicine (CAM) providers, including doctors of osteopathy, doctors of traditional Chinese medicine (TCM), and oncology board certified naturopathic oncologists (Fellows of the American Board of Naturopathic Oncology or FABNOs; <http://www.fabno.org/>), some of whom are co-licensed as acupuncturists. This growing field of medicine is increasingly being referred to as *integrative oncology* (IO). ND, FABNO consultations and some procedures are reimbursed by medical insurance companies in some states in the United States.

Because of their training and their licensed scope of practice, ND, FABNO are among those able to offer comprehensive whole-person integrative cancer care. For this reason, IO clinics directed by ND, FABNOs are a source of high-quality data for describing these therapies and their costs and measuring clinical outcomes. IO clinics are a rich source of data for cost-effectiveness research. Such care consists of a whole-person-oriented approach,

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including a variety of evidence-based complementary and integrative medicine practices that include a diversity of nutrient and botanical natural products, diet and exercise plans, acupuncture, hyperthermia, and mind-body medicine. Many of these therapies are based on clinical evidence.¹⁻⁴ Although cost and cost-benefit analyses of CAM and integrated health care have been conducted^{5,6} and CAM use among breast cancer patients described,⁷ neither IO care nor its costs as it is practiced in community settings has been well described. Description of IO medical services is a required step toward evaluating its impact on disease-free and overall survival in breast cancer as well as measuring its cost-effectiveness.

Washington State provides an ideal environment for our study because IO providers are licensed and regulated by the Washington State Department of Health for all licensed complementary and alternative medicine (CAM) providers and many CAM services such as acupuncture. In Washington State, medical insurers are required to reimburse for visits to licensed CAM providers, including NDs as well as lab tests and imaging studies ordered by NDs. The scope of practice for NDs in Washington State is broad, including the oral, topical, and parenteral prescription of natural substances, including nutrients and botanicals.

The Seattle/Puget Sound area in western Washington State was selected for this study because many women with breast cancer seek care at IO clinics led by experienced ND, FABNOs who treat many breast cancer patients each year. To describe the costs of IO care, we selected a high-volume IO clinic in an academic setting located in the Seattle area of Washington State where there is a large population of breast cancer patients who seek integrative care. The methods used to conduct a matched comparison prospective observational study in CAM community clinics have previously been described.⁸ The current article provides a description of breast cancer IO treatments recommended and their costs per year.

Methods

Participants (n = 324)

Each breast cancer patient who sought IO care at any of the participating naturopathic clinical sites between February 2, 2009, and April 14, 2014, was invited to participate in an observational outcomes study of quality of life and clinical outcomes associated with such care. For each patient who consented to participate, a signed medical release of records was also obtained in order to access and abstract each woman's medical records. Of the 378 cases enrolled in this Bastyr and Fred Hutchinson Cancer Research Center collaborative study, we collected 1 year's worth of treatment recommendations for 324 women. This cohort of participants was used to describe treatments recommended by

ND, FABNOs during the first year of care to women with stage 0 to 4 breast cancer. Contained within this cohort was a nested subset of 287 women who had, at minimum, a second clinic visit within 7 months of their first office call (FOC). Breast cancer patients who received treatment at Bastyr Integrative Oncology Research Center (BIORC) and enrolled in the observational study between February 2, 2009, through January 31, 2015, were used to estimate costs for the cost analysis if they had at least 2 IO clinic visits, and we were able to collect at least 1 year's worth of data (n = 213).

Collection of Data on Stage and Conventional Oncology Treatments Received

Stage of breast cancer at diagnosis was collected for each participant from the Western Washington Cancer Surveillance System, which is part of the national Surveillance Epidemiology and End Results (SEER) database. Stage of breast cancer at the study enrollment date was obtained from conventional medical charts. Conventional oncology medical charts were searched and abstracted for treatment plans and prescriptions.

Abstraction of Data on IO Care

Medical records were requested at the study-defined time points of 6 months and 1 year post-FOC. Trained staff abstracted each chart for types of IO therapy, and dietary and lifestyle recommendations.

Study data were collected and managed by the Bastyr research team for prospective cancer outcomes studies using REDCap (Research Electronic Data Capture) electronic data capture tools hosted at Bastyr University. REDCap is a secure, web-based application designed to support data capture for research studies, providing an intuitive interface for validated data entry, audit trails for tracking data manipulation and export procedures, automated export procedures for seamless data downloads to common statistical packages, and procedures for importing data from external sources.⁹

Chart abstractors identified each IO therapy recorded in the treatment plan. The REDCap data entry form provided the abstractor a checklist of 79 commonly recommended oral and topical CAM therapies, 14 types of injectable therapies, 33 types of dietary recommendations, 10 mind-body medicine therapies, and 8 lifestyle recommendations. This list was generated by the consensus of the lead physicians of the IO clinics. Any therapies not on the checklist were entered into the "other" category and written in as free text. Data gathered included the type and date of physician recommendation. Standard doses and frequencies of doses for each therapy were gathered using a separate physician survey conducted concurrently.

Categorization of IO Treatments

To streamline statistical analyses, some IO treatments that were recommended during conventional standard oncology treatment (eg, surgery, chemotherapy, radiation and hormone, biological and immune therapies) were categorized into 1 of 2 categories. Treatment recommended concurrently with standard oncology treatments were designated as those recommended to the patient while *in treatment*. Treatment recommendations made to any patient during the year following diagnosis were also designated as being recommended in treatment. Treatment recommendations made during the year following standard therapy were categorized as those being made during *survivorship*. Results describe therapies recommended during the first year of IO care for each stage of breast cancer.

Data on IO Physician Consultation and IO Procedures

Electronic health records at the IO clinic that contributed the most participants (BIORC) were used to collect data on number and type of clinic visits using Current Procedural Terminology (CPT) codes. Consultations were defined as office visits, with procedure codes indicating interaction with an IO physician.

Cost Data

Costs of outpatient medical care typically fall into 5 categories: office visit consultation (evaluation and management [E&M] CPT codes), procedures, laboratory tests, imaging, and pharmacy. Because most ND, FABNOs use lab and imaging data provided by requesting each patient's medical oncology records, the largest proportion of IO care falls into 3 categories: office visits (E&M CPT codes), procedures, and natural medicine pharmacy.

Four data sources were used to collect cost data:

1. BIORC electronic billing records were used to collect data on number and cost of visits and procedures using CPT codes for consultation, E&M office visits, and procedures for each patient.
2. BIORC fee schedules were used for pharmacy items.
3. Price data were gathered from commonly used internet websites for typical prices for other natural medicines prescribed to breast cancer patients enrolled in the study (such as the site maintained by Emerson Ecologics, LLC).
4. The costs of procedure recommendations that are not medical procedures, such as "take a yoga, meditation, tai qi, or qi gong class," were obtained from

a survey of local classes advertised in the Seattle area.

Cost data from these 4 data sources was entered into a relational database for analysis. Visit, procedure, and pharmacy costs were stratified by stage of the patient at the first office visit and whether the treatment recommendations were made during each woman's primary standard oncology treatment period or during survivorship after completion of initial treatment. Additionally, the percentage of cost covered by insurance and the percentage paid by the patient was also included in the analysis.

Results

Table 1 shows the race, ethnicity, and age for the entire cohort of breast cancer patients who utilized IO care and enrolled in the outcomes study (n = 324).

Table 2 shows the histological characteristics of the 324 breast cancer patients who received IO care. Most (65%) patients' tumors were infiltrating ductal carcinoma, and only 6% were lobular carcinoma.

Table 3 shows the stage of 324 IO breast cancer patients at their first presentation to a participating IO clinic, who consented to participate on an observational outcomes study. Most (57%) of the women were at stage 1 and 2 when they first presented to the IO clinic. Only 3.7% were stage 4 when they presented to the IO clinic.

Table 4 presents the number of consultations, the main types of IO therapies prescribed during the first year of IO care, and the recommendations that were made to complement standard oncological treatment, which were prescribed at visits that occurred during each woman's survivorship period.

Table 4 also presents finer detail regarding the timing of specific IO therapies in relation to standard treatment (chemotherapy/radiation) and during the posttreatment survivorship period. Intravenous (IV) therapies were administered mostly after completion of chemotherapy during survivorship. The number of clinic visits per patient per year ranged widely from 1 to 32. The mean number of visits during the first year of IO care ranged from 6.57 (± 7.27) in stage 0 to 4.53 for stage 1 and a mean of 5.88 visits in the first year in stage 4 patients.

Of the entire cohort of 324, most (88%; 287) of the women had at least 2 office visits. Table 4 shows that the most frequently prescribed therapies were botanical and nutritional medicines (supplements); 100% of visits that occurred during conventional primary treatment included prescriptions of orally administered natural substances. The other commonly recommended therapies included acupuncture provided by TCM practitioners. Many (49%) of the 287 women in the nested cohort had a consultation with a TCM provider. Of these, most received acupuncture

Table 1. Demographic Description of 324 Women With Breast Cancer Who Utilized Integrative Oncology Medical Services in 2009-2014.^a

Race/Ethnicity/Age (n = 324)	Percentage (n)
Race	
White	88.58 (287)
Other Asian	1.54 (5)
Mixed	1.23 (4)
Black	0.61 (2)
Chinese	0.61 (2)
Japanese	0.30 (1)
American Indian, Aleutian, or Eskimo	0.30 (1)
Asian Indian	0.30 (1)
Asian Indian or Pakistani	0.30 (1)
Unknown	6.17 (20)
Japanese	0.30 (1)
American Indian, Aleutian, or Eskimo	0.30 (1)
Ethnicity	
Non-Hispanic	91.97 (298)
Hispanic	1.85 (6)
Unknown	6.17 (20)
Age	
Minimum	28
Maximum	82
Mean (SD)	54.0 (10.6)

^aIncludes cohort 1 patients with a signed medical records release and known diagnosis date enrolled in the study before January 1, 2014. All data are from the Cancer Surveillance System.

during their first year of IO care. Acupuncture was more likely to be prescribed during the year of primary oncological treatment compared with the survivorship year. TCM herbs were prescribed less frequently than acupuncture. Dietary recommendations were made to 65% of women and lifestyle modifications to 63%. Some form of exercise was the most common lifestyle recommendation. Mind-body therapy was prescribed to 45% of the patients during both the first year of standard treatment and to a similar percentage of women during survivorship.

Table 5 presents details on specific types and frequencies of therapies recommended to 287 breast cancer patients who had at least 2 visits with an ND, FABNO and who enrolled before January 1, 2014, and had at least 2 office visits. Table 5 includes the list and frequency of recommendations for the recommended treatments abstracted from the patient's IO records. More than 72 specific oral or topical nutritional-, botanical-, fungal-, and bacterial-based medicines were prescribed to the cohort during their first year of IO care. The most common therapy prescribed was standardized capsules of dried extract of *Trametes versicolor*, which was prescribed to 63% of the women as a chemotherapy-compatible immune therapy.

Other commonly prescribed therapies, in order of frequency, included vitamin D3 (60%), melatonin (49%),

Table 2. Types of Breast Cancer Diagnosed in 324 Women With Breast Cancer Who Received IO Medical Care 2009-2014 in Western Washington.^a

Breast Cancer Histology (n = 324)	Percentage (n)
Infiltrating duct carcinoma, NOS	66.35 (215)
Lobular carcinoma, NOS	6.17 (20)
Infiltrating duct and lobular carcinoma	4.62 (15)
Duct carcinoma in situ, solid type	3.08 (10)
Intraductal carcinoma, noninfiltrating, NOS	2.16 (7)
Infiltrating duct mixed with other types of carcinoma	1.85 (6)
Infiltrating duct mixed with other types of carcinoma, in situ	1.54 (5)
Comedocarcinoma, noninfiltrating	1.23 (4)
Cribiform carcinoma in situ	1.23 (4)
Adenoid cystic carcinoma	0.61 (2)
Intraductal and lobular in situ carcinoma	0.61 (2)
Lobular carcinoma in situ	0.61 (2)
Noninfiltrating intraductal papillary adenocarcinoma	0.61 (2)
Paget disease and infiltrating duct carcinoma	0.30 (1)
Paget disease and intraductal carcinoma	0.30 (1)
Tubular adenocarcinoma	0.30 (1)
Intracystic carcinoma, NOS	0.30 (1)
Invasive micropapillary carcinoma	0.30 (1)
Mucinous adenocarcinoma	0.30 (1)
Apocrine adenocarcinoma	0.30 (1)
Carcinoma, NOS	0.30 (1)
Hemangiosarcoma	0.30 (1)
Unknown	6.48 (21)

^aIncludes cohort 1 patients with a signed MRR and known diagnosis date enrolled in the study before January 1, 2014. All data are from the Cancer Surveillance System.

Table 3. Stage of Breast Cancer at Study Enrollment?^a

Stage (n = 324)	Percentage (n)
Stage 0	6.17 (20)
Stage 1	21.91 (71)
Stage 2	25.00 (81)
Stage 3	9.87 (32)
Stage 4	3.70 (12)
Unknown	33.33 (108)

^aIncludes cohort 1 patient with a signed MRR and known diagnosis date enrolled in the study before January 1, 2014. Stage was abstracted from the patient's medical record at study enrollment. If that was not available, then the Cancer Surveillance System stage at diagnosis was used if time from diagnosis to enrollment was <2 years.

omega 3 fatty acids (45%), curcumin (*Curcuma longa*) (39%), magnesium (37%), coenzyme Q10 (29%), sea

Table 4. Frequency of Office Visits and Types of Integrative Oncology Treatments in a Cohort of Breast Cancer Patients Who Received IO Medical Services.^a

Stage at FOC	Treatment Period	Participants With 2 or More Office Visits										
		Consultations					IO Recommendations					
		Total Percentage (n)	Only 1 Visit, Percentage (n)	2+ Visits, Percentage (n)	Average Patient Visits/Month, Mean (SD)	Months Diagnosis to First Office Visit, Mean (SD)	Diet, Percentage (n)	Injectable, Percentage (n)	Lifestyle, Percentage (n)	Mind-Body, Percentage (n)	Supplements, Percentage (n)	TCM, Percentage (n)
Stage 0	In treatment	8.45 (17)	5.88 (1)	8.69 (16)	0.59 (0.65)	3.53 (2.61)	50.00 (8)	18.75 (3)	37.50 (6)	25.00 (4)	100.00 (16)	43.75 (7)
	Survivorship	5.10 (10)	0.00 (0)	5.68 (10)	0.40 (1.77)	47.00 (58.02)	40.00 (4)	20.00 (2)	50.00 (5)	20.00 (2)	100.00 (10)	30.00 (3)
	Total	6.17 (20)	2.70 (1)	6.62 (19)	0.43 (0.38)	10.77 (26.06)	52.63 (10)	21.05 (4)	57.89 (11)	31.57 (6)	100.00 (19)	47.36 (9)
Stage 1	In treatment	32.83 (66)	23.52 (4)	33.69 (62)	0.45 (0.33)	3.51 (2.64)	67.74 (42)	8.06 (5)	64.51 (40)	32.25 (20)	100.00 (62)	32.25 (20)
	Survivorship	12.75 (25)	0.00 (0)	14.20 (25)	0.55 (4.21)	15.19 (3.34)	40.00 (10)	8.00 (2)	40.00 (10)	28.00 (7)	84.00 (21)	28.00 (7)
	Total	21.91 (71)	10.81 (4)	23.34 (67)	0.36 (0.30)	4.47 (4.19)	68.65 (46)	8.95 (6)	65.67 (44)	40.29 (27)	100.00 (67)	37.31 (25)
Stage 2	In treatment	38.30 (77)	35.29 (6)	38.58 (71)	0.55 (0.39)	3.60 (2.84)	74.64 (53)	16.90 (12)	74.64 (53)	38.02 (27)	100.00 (71)	59.15 (42)
	Survivorship	16.83 (33)	0.00 (0)	18.75 (33)	0.60 (5.30)	22.00 (6.21)	48.48 (16)	6.06 (2)	42.42 (14)	33.33 (11)	96.96 (32)	24.24 (8)
	Total	25.00 (81)	16.21 (6)	26.13 (75)	0.51 (0.42)	4.62 (5.22)	80.00 (60)	18.66 (14)	74.66 (56)	44.00 (33)	100.00 (75)	61.33 (46)
Stage 3	In treatment	10.94 (22)	11.76 (2)	10.86 (20)	0.87 (0.96)	3.35 (3.29)	65.00 (13)	35.00 (7)	75.00 (15)	50.00 (10)	100.00 (20)	70.00 (14)
	Survivorship	10.71 (21)	15.00 (3)	10.22 (18)	0.40 (1.43)	16.83 (3.31)	55.55 (10)	16.66 (3)	27.77 (5)	22.22 (4)	88.88 (16)	33.33 (6)
	Total	9.87 (32)	13.51 (5)	9.40 (27)	0.49 (0.59)	6.86 (6.85)	81.48 (22)	37.03 (10)	66.66 (18)	51.85 (14)	100.00 (27)	74.07 (20)
Stage 4	In treatment	4.97 (10)	0.00 (0)	5.43 (10)	0.48 (0.26)	3.66 (2.69)	30.00 (3)	20.00 (2)	50.00 (5)	30.00 (3)	100.00 (10)	80.00 (8)
	Survivorship	3.57 (7)	0.00 (0)	3.97 (7)	0.99 (2.16)	13.00 (0.00)	14.28 (1)	28.57 (2)	42.85 (3)	42.85 (3)	71.42 (5)	14.28 (1)
	Total	3.70 (12)	0.00 (0)	4.18 (12)	0.49 (0.26)	4.59 (3.89)	25.00 (3)	33.33 (4)	58.33 (7)	41.66 (5)	100.00 (12)	66.66 (8)
Unknown	In treatment	4.47 (9)	23.52 (4)	2.71 (5)	0.17 (2.14)	3.60 (3.36)	40.00 (2)	40.00 (2)	40.00 (2)	40.00 (2)	100.00 (5)	60.00 (3)
	Survivorship	51.02 (100)	85.00 (17)	47.15 (83)	0.14 (14.24)	90.45 (61.24)	50.60 (42)	43.37 (36)	40.96 (34)	38.55 (32)	98.79 (82)	39.75 (33)
	Total	33.33 (108)	56.75 (21)	30.31 (87)	0.63 (1.16)	85.15 (62.90)	50.57 (44)	43.67 (38)	41.37 (36)	39.08 (34)	98.85 (86)	41.37 (36)
Total n (all stages)	In treatment	201	17	184								
	Survivorship	196	20	176								
	Total	324	37	287								

Abbreviations: IO, integrative oncology; TCM, traditional Chinese medicine; FOC, first office call. ^aIncludes cohort: 1 patients from all sites with a signed MRR and known diagnosis date enrolled in the study before January 1, 2014. Stage is what was abstracted from the patient's medical record at study enrollment. If that was not available, then the Cancer Surveillance System stage at diagnosis was used. Included are the first 12 months of IO recommendations. Consultations are office visits with procedure codes indicating interaction with an IO physician. Consultations were calculated from Bastry: Integrative Oncology Clinic patients only. "In treatment" refers to any patient < 1 year postdiagnosis who has a completed IO treatment eCRF dated before the 1-year diagnosis anniversary. "Survivorship" refers to any patient > 1 year postdiagnosis.

Table 5. Types and Frequency of Integrative Oncology Treatments Prescribed to Breast Cancer Patients.

IO Treatments Prescribed (n = 324)	Total Percentage (n)
Supplement recommendations ^a	
Coriolus (<i>Trametes versicolor</i> , Turkey Tail, Yun Zhi, PSP)	62.65 (203)
Vitamin D3	59.56 (193)
Melatonin	48.76 (158)
Omega 3 fatty acids (fish oil, DHA, EPA)	45.37 (147)
Curcumin (Meriva)	38.88 (126)
Magnesium (Triple-mag, Cal-mag)	36.72 (119)
Coenzyme Q10	28.39 (92)
L-Glutamine	24.69 (80)
Quercetin	24.38 (79)
Enzymes (digestive, pancreatic)	23.45 (76)
Vitamin B (complex, B12, B6, all B)	22.53 (73)
Bromelain	21.91 (71)
Probiotics	20.67 (67)
Calcium	20.37 (66)
Multiple vitamin and mineral supplement	18.82 (61)
Modified citrus pectin	17.59 (57)
Green tea	16.66 (54)
Sea weed poultice	13.58 (44)
Vitamin E, topical	11.41 (37)
α-Lipoic acid	11.11 (36)
Vitamin C, oral	9.87 (32)
Acetyl-L-carnitine	9.25 (30)
Arnica, sublingual (6C, 30C, 90C, 200C)	9.25 (30)
L-Carnitine	8.95 (29)
Hawthorne	8.64 (28)
Black cohosh	8.33 (27)
Indole-3-carbinole	8.33 (27)
Boron	8.02 (26)
Omega 6 fatty acids (flaxseed oil, evening primrose oil, borage)	7.71 (25)
Vitamin E (oral)	7.71 (25)
Mushroom extract containing multiple mushroom species	7.09 (23)
Smooth Move tea	6.79 (22)
Castor oil, topical	6.48 (21)
Aspirin	6.17 (20)
Tea tree oil	6.17 (20)
Bioidentical estriol	5.86 (19)
Calendula	5.86 (19)
Rhizinate	5.86 (19)
Topical ibuprofen	5.86 (19)
Armour or other thyroid supplement	4.93 (16)
Ashwagandha	4.93 (16)
Topical cold therapy	4.93 (16)
Zinc	4.93 (16)
DermaQOL	4.62 (15)
Milk thistle (UltraThistle, silymarin, silybin)	4.32 (14)

(continued)

Table 5. (continued)

IO Treatments Prescribed (n = 324)	Total Percentage (n)
Citalopram	4.01 (13)
Epsom salt bath	4.01 (13)
Astragalus	3.70 (12)
Peppermint oil	3.70 (12)
Traumeel	3.70 (12)
GABA	3.39 (11)
Glucosamine	3.39 (11)
Honey	3.39 (11)
Cannabis	3.08 (10)
Ibuprofen	3.08 (10)
N-acetyl cysteine	3.08 (10)
Vitamin K2	3.08 (10)
Zen or ZenMind	3.08 (10)
Injectable recommendations ^b	
IV vitamin C (ascorbic acid)	12.34 (40)
Vitamin B complex, intramuscular	11.72 (38)
IV artesunate (artemisinin)	7.40 (24)
IV immune therapy (nutrition therapy; includes Aminosyn, Freamine)	3.70 (12)
IV hydration (normal saline, sodium chloride, dextrose)	2.16 (7)
Traditional Chinese medicine (TCM) recommendations ^b	
Acupuncture	41.66 (135)
TCM herbs (including Marrow Plus)	4.01 (13)
TCM consultation	3.08 (10)
Dietary recommendations ^b	
Increase green tea	24.38 (79)
Referral for nutritional counseling	20.37 (66)
Increase vegetables	16.35 (53)
Whole food diet	16.35 (53)
Increase protein	13.88 (45)
Broth fast	13.58 (44)
Increase water	13.58 (44)
Reduce sugar	7.09 (23)
No dairy	6.79 (22)
Increase fish	6.17 (20)
Increase fiber	5.55 (18)
Decrease mammalian fat	5.24 (17)
Increase fruit	5.24 (17)
Whey protein	5.24 (17)
Lower glycemic index	3.08 (10)
Electrolyte energy drink	2.46 (8)
Increase legumes	2.16 (7)
Juice fast	2.16 (7)
No wheat	2.16 (7)
Nutritional reading	2.16 (7)
Mind-body recommendations ^b	
Mind-body therapy	15.43 (50)
Meditation	11.11 (36)
Massage	8.02 (26)
Qi Gong Group	7.71 (25)

(continued)

Table 5. (continued)

IO Treatments Prescribed (n = 324)	Total Percentage (n)
Craniosacral therapy	6.79 (22)
Deep breathing exercises	6.48 (21)
Lifestyle recommendations ^b	
Exercise	32.71 (106)
Walking	29.32 (95)
Sleep hygiene	13.27 (43)
Stress management	10.49 (34)
Yoga	8.95 (29)
Sauna	4.01 (13)
Exercise, weight bearing	3.08 (10)

Abbreviations: DHA, docosahexaenoic acid; EPA, eicosapentaenoic acid; GABA, γ -aminobutyric acid; IV, intravenous, PSP, polysaccharide peptide.

^aIncludes cohort 1 patients with a known diagnosis date enrolled in the study before January 1, 2014. Included are the first 12 months of IO recommendations. Only recommendations given for >3% of the participants (n = 10) are included.

^bIncludes cohort 1 patients with a known diagnosis date enrolled in the study before January 1, 2014. Included are the first 12 months of IO recommendations. Only recommendations given for >2% of the participants (n = 7) are included.

weed poultice and/or vitamin E topically for radiation burn (25%), plant and pancreatic enzymes (23%), bromelain (22%), L-glutamine (25%), quercetin (24%), probiotic bacteria (21%), multiple vitamin and mineral supplement (19%), vitamin B complex orally (19%), citrus pectin (18%), green tea (*Camellia sinensis*) extract (17%), α -lipoic acid (11%), acetyl-L-carnitine (9%), and homeopathic arnica (9%).

Of the 287 women described in Tables 4 to 6, 76 (26%) were prescribed some type of injectable therapy. Injectable IO therapies included subcutaneous injections of mistletoe (*Viscum album*) and a diversity of parenteral therapies that included vitamin B complex intramuscularly (12%), IV high-dose ascorbate (12%), IV artemisinin (7%), and IV nutrition and hydration (4%). Injectable therapies were used almost exclusively in stage 4 breast cancer patients (data not shown).

Whereas some patients (20%) were referred for nutritional counseling by a certified nutritionist, most received dietary advice from the IO physician within the visit. Dietary recommendations included increased green tea as a drink (24%), increased vegetables (17%), broth fast (16%), increased protein (13%), increased water (15%), reduced simple sugars (8%), increased fish (7%), and decreased mammalian fat (5%). Some type of mind-body therapy was recommended to 45% of patients. Meditation was prescribed to 15% of the breast cancer patients by their IO physician. Qi gong was recommended to 8% of the women. Yoga was recommended to 9%. The most common lifestyle recommendations made included walking (29% of patients were asked to walk more each day).

Integrative Oncology Cost Data

Table 6 shows the amount charged for all visits for 1 year of IO care in stages 0, 1, 2, 3, and 4 and those of unknown stage breast cancer. Of the total amount billed for 1 year for 287 breast cancer patients, 21% was out of pocket. Insurance reimbursement paid for 39.1%. The remaining 39.5% was written off by the university. The direct costs of care include medical visits (naturopathic oncology consultation and mind-body medicine visits), procedures (acupuncture), and pharmacy. Pharmacy includes nutritional and botanical medicines administered orally, intravenously, subcutaneously, intramuscularly, or topically. Yearly cost for office visits ranged from \$512/year to \$1084/year. Stage 3 women had the most visits and the highest visit costs compared with women at other stages of breast cancer at diagnosis.

Visits were subcategorized into 2 types: those made by women during the first year after diagnosis with breast cancer—that is, during the treatment year—compared with the second year after diagnosis, which is for most women the first year of postsurgical, postchemotherapy, and postradiotherapy survivorship.

Table 7 summarizes the fees charged for the most common CPT codes billed by ND, FABNO offices in Washington State for E&M clinic visits and procedures, including acupuncture and IV therapy. In Washington State most medical insurers reimburse for naturopathic and TCM medical visits and acupuncture as a medical procedure. These E&M and procedure fees scheduled are set by insurers. Although the infusion therapies delivered by ND, FABNOs are within the scope of their Washington State license, only those administered for rehydration and nutritional deficiencies are billed to the patient's medical insurance because they are not considered experimental.

We asked the ND, FABNOs to describe an ideal core protocol for IO care for each stage and type of breast cancer. We then calculated the cost of IO pharmacy for 1 year of care for a stage 4 cancer patient. Table 8 presents an IO core therapy program for 1 year of treatment for a stage 4 breast cancer patient. Total cost of the medicines used in this treatment plan for 1 year is approximately \$27 137. Parenteral therapies were the most costly of IO treatments, and few stage 4 breast cancer patients completed such an idealized treatment. Total costs (visits and IO pharmacy and procedures) of 1 year of IO treatment for a women with progressing stage 4 breast cancer is approximately \$31 662/year. ND, FABNO visits cost approximately \$4525/year (see Table 3). Office visits are reimbursed by medical insurance providers, including Medicaid but not Medicare.

Discussion

Naturopathic oncology provided to women with breast cancer included a wide diversity of evidence-based CAM

Table 6. Costs of Integrative Oncology Care in Women With Breast Cancer (US\$).^a

Stage at FOC	Treatment Period	Patients, Percentage (n)	Mean Cost/Patient for Office Visits	IO Recommendations										Total Average Cost/Patient	
				Diet, Percentage of Patients (n), Mean Cost/Patient	IV, Percentage of Patients (n), Mean Cost/Patient	Lifestyle, Percentage of Patients (n), Mean Cost/Patient	Mind-Body, Percentage of Patients (n), Mean Cost/Patient	Supplements, Percentage of Patients (n), Mean Cost/Patient	TCM, Percentage of Patients (n), Mean Cost/Patient						
Stage 0	In treatment	8.69 (16)	712.90	43.75 (7), 32.50	18.75 (3), 36.00	31.25 (5), 15.60	25.00 (4), 0.00	100.00 (16), 1554.15	43.75 (7), 410.17						3184.47
	Survivorship	5.68 (10)	536.59	30.00 (3), 75.83	20.00 (2), 22.64.24	50.00 (5), 0.00	20.00 (2), 390.00	100.00 (10), 776.02	20.00 (2), 257.21						1917.65
	Total	6.62 (19)	804.96	42.10 (8), 56.87	21.05 (4), 38.32.13	52.63 (10), 78.00	31.57 (6), 130.00	100.00 (19), 1527.73	42.10 (8), 364.28						3398.89
Stage 1	In treatment	33.69 (62)	583.08	64.51 (40), 102.37	8.06 (5), 1907.38	61.29 (38), 184.73	32.25 (20), 487.50	100.00 (62), 1503.68	30.64 (19), 471.35						2721.58
	Survivorship	14.20 (25)	617.44	40.00 (10), 136.50	8.00 (2), 23.12.12	40.00 (10), 15.60	28.00 (7), 334.28	84.00 (21), 1057.66	28.00 (7), 471.36						2033.43
	Total	23.34 (67)	694.19	65.67 (44), 108.57	8.95 (6), 1590.23	62.68 (42), 204.28	40.29 (27), 447.77	100.00 (67), 1612.40	35.82 (24), 471.36						2997.66
Stage 2	In treatment	38.58 (71)	744.27	74.64 (53), 98.72	16.90 (12), 1978.87	70.42 (50), 124.79	33.80 (24), 682.50	100.00 (71), 1810.97	57.74 (41), 463.01						3549.36
	Survivorship	18.75 (33)	728.55	39.39 (13), 52.50	6.06 (2), 22.64.24	36.36 (12), 0.00	33.33 (11), 1099.09	96.96 (32), 1128.16	24.24 (8), 471.36						2461.07
	Total	26.13 (75)	944.59	80.00 (60), 91.00	18.66 (14), 2019.64	72.00 (54), 115.55	40.00 (30), 858.00	100.00 (75), 1966.60	60.00 (45), 463.75						4065.64
Stage 3	In treatment	10.86 (20)	878.05	60.00 (12), 37.91	35.00 (7), 2684.91	70.00 (14), 167.14	45.00 (9), 780.00	100.00 (20), 2109.61	70.00 (14), 446.92						4730.98
	Survivorship	10.22 (18)	521.6	50.00 (9), 126.38	16.66 (3), 4589.32	22.22 (4), 0.00	16.66 (3), 1950.00	88.88 (16), 1348.33	33.33 (6), 471.36						3030.32
	Total	9.40 (27)	915.17	74.07 (20), 79.62	37.03 (10), 3256.24	62.96 (17), 137.64	44.44 (12), 1072.50	100.00 (27), 2163.51	74.07 (20), 454.25						5243.50
Stage 4	In treatment	5.43 (10)	731.87	30.00 (3), 75.83	20.00 (2), 2314.37	50.00 (5), 0.00	30.00 (3), 520.00	100.00 (10), 1647.57	80.00 (8), 476.74						3402.47
	Survivorship	3.97 (7)	590.91	14.28 (1), 0.00	28.57 (2), 6881.74	42.85 (3), 0.00	42.85 (3), 0.00	71.42 (5), 789.89	14.28 (1), 471.36						3188.67
	Total	4.18 (12)	900.89	25.00 (3), 75.83	33.33 (4), 4598.05	58.33 (7), 0.00	41.66 (5), 312.00	100.00 (12), 1694.11	66.66 (8), 476.74						4594.48
Unknown	In treatment	2.71 (5)	992.25	40.00 (2), 227.50	40.00 (2), 6033.49	20.00 (1), 0.00	40.00 (2), 975.00	100.00 (5), 2030.14	60.00 (3), 485.71						6208.23
	Survivorship	47.15 (83)	1254.88	50.60 (42), 70.41	43.37 (36), 6830.81	39.75 (33), 141.81	34.93 (29), 712.75	98.79 (82), 1483.60	39.75 (33), 462.29						6208.24
	Total	30.31 (87)	1137.13	50.57 (44), 77.55	43.67 (38), 6788.85	39.08 (34), 137.64	35.63 (31), 729.67	98.85 (86), 1532.63	41.37 (36), 464.24						6162.51
Total n (all stages)	In treatment	184													
	Survivorship	176													
	Total	287													

Abbreviations: IO, integrative oncology; TCM, traditional Chinese medicine; FOC, first office call.

^aCost of IO care for IO patients with 2 or more IO physician consultations. Includes cohort 1 patients from all sites with a signed MRR and known diagnosis date enrolled in the study before January 1, 2014, and who had had at least 2 consultations with an IO physician. Included are the first 12 months of IO recommendations. Consultations are office visits with procedure codes indicating interaction with an IO physician. "In treatment" refers to any patient < 1 year postdiagnosis who has a completed IO treatment eCRF dated before the 1-year diagnosis anniversary. "Survivorship" refers to any patient > 1 year postdiagnosis who has a completed IO treatment eCRF dated after the 1-year diagnosis anniversary. Office visit mean cost/patient is for consultations only, based on average cost of \$238.52 for a first office visit and \$137.04 for a follow-up visit. Office visit costs were calculated from Bastyr Integrative Oncology Clinic patient data.

Table 7. CPT Codes and Fees Used (US\$) and Insurance Reimbursement for Integrative Oncology Services in Western Washington State.

CPT Code	Procedure	Amount Charged	Insurance Adjustment	Insurance Payment	Patient Adjustment	Patient Payment
36415	Venipuncture	15.13	9.11	2.39	0.27	3.34
36591	Collection of blood specimen	38.00	11.69	17.88	2.66	5.75
36592	Collection of blood specimen	42.00	6.30	0.00	0.00	35.69
69210	Removal impacted cerumen, 1 or both ears	78.00	0.00	0.00	27.00	51.00
81000	Urinalysis, by dip stick	10.00	10.00	0.00	0.00	0.00
81002	Urinalysis, by dip stick	7.00	0.00	0.00	0.00	0.00
86580	Skin test; tuberculosis, intradermal	20.00	0.00	0.00	0.00	20.00
87210	Smear, primary source with interpretation	15.00	9.83	1.79	0.00	3.37
90801	Psychiatric diagnostic interview examination	210.00	18.91	139.58	30.00	21.50
90805	Individual psychotherapy, approximately 20 to 30 minutes	112.00	15.28	96.70	0.00	0.00
90806	Individual psychotherapy, approximately 45 to 50 minutes	69.50	0.00	0.00	24.50	45.00
90807	Individual psychotherapy, approximately 45 to 50 minutes	145.37	31.71	67.93	22.03	21.09
90809	Individual psychotherapy, approximately 75 to 80 minutes	223.72	42.92	163.61	0.00	17.17
90838	Psychotherapy; 60 minutes	215.00	47.20	106.44	15.73	45.61
94760	Noninvasive ear or pulse oximetry for oxygen saturation	16.00	8.25	0.00	1.25	6.50
96360	Intravenous infusion, hydration; initial, 31 minutes to 1 hour	80.00	56.22	0.00	0.00	23.77
96361	Intravenous infusion, hydration; each additional hour	30.00	4.05	5.05	9.51	16.65
96365	Intravenous infusion; initial, up to 1 hour	100.00	3.83	43.36	19.07	33.72
96366	Intravenous infusion; each additional hour	30.00	0.84	13.70	5.40	10.05
96372	Therapeutic, prophylactic, or diagnostic injection; subcutaneous or intramuscular	28.50	4.57	15.45	2.32	6.09
97026	Infrared application	14.76	6.14	5.02	0.53	3.05
97032	Electrical stimulation (manual), each 15 minutes	30.00	5.02	14.97	0.00	0.00
97034	Contrast baths, each 15 minutes	27.33	4.07	13.92	0.00	0.00
97035	Ultrasound, each 15 minutes	35.00	24.96	9.03	0.00	1.00
97036	Hubbard tank, each 15 minutes	51.00	0.16	45.16	0.00	0.00
97110	Therapeutic exercises; each 15 minutes	35.00	8.00	24.30	-4.79	7.50
97112	Therapeutic neuromuscular reeducation, each 15 minutes	36.00	8.42	26.11	0.00	1.46
97124	Therapeutic massage, each 15 minutes	21.00	3.41	17.57	0.00	0.00
97140	Manual therapy techniques, each 15 minutes	63.27	17.82	31.29	3.78	6.46
97602	Removal of devitalized tissue from wound(s)	45.00	30.00	0.00	3.50	11.49
97802	Medical nutrition therapy; initial assessment and intervention, each 15 minutes	159.86	33.83	60.89	25.39	39.73
97803	Medical nutrition therapy; reassessment and intervention, each 15 minutes	165.00	95.64	54.35	0.00	15.00
97810	Acupuncture; initial 15 minutes	45.76	4.66	18.51	5.74	15.47
97811	Acupuncture; each additional 15 minutes	39.08	5.45	17.42	6.21	8.55
97813	Acupuncture with electrical stimulation, initial 15 minutes	50.43	3.60	28.91	2.88	14.78
97814	Acupuncture with electrical stimulation, each additional 15 minutes	40.11	1.77	26.09	3.24	8.73
98925	Osteopathic manipulative treatment; 1-2 body regions	52.52	7.20	22.85	11.41	7.46
98926	Osteopathic manipulative treatment; 3-4 body regions	68.00	0.00	68.00	0.00	0.00
99070	Supplies and materials provided	16.38	0.00	4.69	0.00	0.00
99201	Office visit for evaluation and mgmt of a new patient; 10 minutes	71.33	38.33	12.33	6.33	14.33
99202	Office visit for evaluation and mgmt of a new patient; 20 minutes	86.51	19.89	26.03	16.01	23.53
99203	Office visit for evaluation and mgmt of a new patient; 30 minutes	152.63	42.68	48.00	18.07	43.87
99204	Office visit for evaluation and mgmt of a new patient; 45 minutes	239.36	60.91	100.95	20.84	56.64
99205	Office visit for evaluation and mgmt of a new patient; 60 minutes	309.58	99.88	136.21	28.48	44.36
99211	Office visit for evaluation and mgmt of an established patient; 5 minutes	41.37	6.70	12.41	6.18	14.63
99212	Office visit for evaluation and mgmt of an established patient; 10 minutes	61.24	14.51	19.39	10.56	14.84
99213	Office visit for evaluation and mgmt of an established patient; 15 minutes	106.70	30.36	38.82	12.84	23.73
99214	Office visit for evaluation and mgmt of an established patient; 25 minutes	160.34	51.77	64.15	11.26	31.74
99215	Office visit for evaluation and mgmt of an established patient; 40 minutes	209.69	63.01	106.39	12.33	25.13
99244	Office visit for evaluation and mgmt of an established patient; 60 minutes	230.00	59.00	151.00	0.00	20.00
99245	Office visit for evaluation and mgmt of an established patient; 80 minutes	250.00	13.55	150.73	28.57	57.14
99347	Home visit for evaluation and mgmt of an established patient; 15 minutes	55.00	0.00	40.00	0.00	15.00
99354	Prolonged service in the office; first hour	151.67	44.35	86.67	6.84	13.80

(continued)

Table 7. (continued)

CPT Code	Procedure	Amount Charged	Insurance Adjustment	Insurance Payment	Patient Adjustment	Patient Payment
99358	Prolonged evaluation and management service; first hour	250.00	250.00	0.00	0.00	0.00
99396	Comprehensive preventive medicine reevaluation and mgmt of an established patient; 40-64 years	147.00	29.96	117.03	0.00	0.00
99401	Preventive medicine counseling; 15 minutes	71.00	71.00	0.00	0.00	0.00
99402	Preventive medicine counseling; 30 minutes	92.00	92.00	0.00	0.00	0.00
99404	Preventive medicine counseling; 60 minutes	164.00	14.80	149.19	0.00	0.00
99441	Telephone evaluation and mgmt; 5-10 minutes of medical discussion	25.00	2.02	0.35	4.35	18.26
99442	Telephone evaluation and mgmt; 11-20 minutes of medical discussion	40.00	4.70	0.00	5.58	29.70
99443	Telephone evaluation and mgmt; 21-30 minutes of medical discussion	65.00	0.00	0.00	12.00	53.00
A4217	Sterile water/saline, 500 mL	7.79	2.52	1.82	1.31	2.13
BIO MAT	BioMat	29.16	8.33	0.00	17.66	3.17
DCA	IV DCA	50.00	0.00	0.00	7.50	42.50
E0205	Heat lamp, with stand, includes bulb, or infrared element	40.00	0.00	0.00	9.58	30.41
J0610	Injection, calcium gluconate, per 10 mL	10.67	8.51	0.63	0.20	1.32
J1200	Injection, diphenhydramine HCl, up to 50 mg	3.00	1.62	0.69	0.34	0.33
J1212	Injection, DMSO, dimethyl sulfoxide, 50%, 50 mL	20.00	0.00	20.00	0.00	0.00
J3415	Injection, pyridoxine HCl, 100 mg	12.00	4.58	7.41	0.00	0.00
J3420	Injection, vitamin B-12 cyanocobalamin, up to 1000 µg	7.49	5.45	0.52	0.25	1.24
J3475	Injection, magnesium sulfate, per 500 mg	3.25	1.32	0.22	0.43	1.26
J3480	Injection, potassium chloride, per 2 mEq	7.01	3.55	0.07	1.26	2.12
J3490	Unclassified drugs	39.61	8.77	17.34	6.15	7.31
J7040	Infusion, normal saline solution, sterile (500 mL = 1 unit)	5.59	2.30	0.48	0.89	1.91
J7042	5% Dextrose/Normal saline (500 mL = 1 unit)	6.37	3.88	0.30	0.44	1.74
J7050	Infusion, normal saline solution, 250 cc	4.78	4.25	0.53	0.00	0.00

Abbreviations: CPT, Current Procedural Terminology; mgmt, management; IV, intravenous; DCA, dichloroacetic acid.

Table 8. Typical Costs (US\$) of 1 Year of Idealized Integrative Oncology Medicine for a Stage 4 Breast Cancer Patient.

Treatment	Dosage	Frequency	Cost for Course of Treatment (\$)
Bromelain	1500 mg	Daily	627.80
Curcumin	3000 mg	Daily	450.17
Green tea	2000 mg	Daily	87.38
IV artesunate	120 mg	Weekly	12064.00
IV ascorbic acid	100 g	Weekly	12064.00
Melatonin	20 mg	Daily	24.30
Mistletoe injections	1 Injection	3 Times per week	710.55
<i>Trametes versicolor</i> mushroom	3000 mg	Daily	608.33
Vitamin D3	5000 IU	Daily	14.45
Coenzyme Q10	100 mg	Daily	307.20
Wobenzyme™ digestive enzymes	3 Tablets	Daily	178.98
Total cost			27137.16

Abbreviation: IV, intravenous.

therapies that included acupuncture, nutritional medicines (vitamin D3, acetyl-L-carnitine, L-glutamine, α -lipoic acid, magnesium, omega 3 fatty acids, coenzyme Q10, vitamin B complex), mycological medicine (*T versicolor*), botanical medicines (curcumin (*Curcuma longa*), bromelain, green tea (*Camellia sinensis*), quercetin, black cohosh (*Cimicifuga racemosa*), biological products (digestive enzymes and probiotics), exercise, dietary prescriptions, and meditation.

The total costs incurred per year for BIORC participants ranged from \$1594/year for early-stage breast cancer to more than \$5000/year for stage 3 and 4 breast cancer patients and those who could not be staged at FOC. Costs are highest during the postdiagnosis period when standard oncology treatment is occurring and increases with stage at BIORC first visit. Of the total amount billed for IO care for 1 year for 287 breast cancer patients, 21% was out-of-pocket. Insurance reimbursement paid for 39.1%. The

remaining 39.5% was written off by BIORC. This level of institutional write off is not unusual. IO clinics commonly expect at least a 35% difference between what is billed to insurers and what insurers pay.

A comprehensive protocol for stage 4 breast cancer includes IV nutrients and botanicals plus oral and topical natural medicine and costs approximately \$32 000/year. Regardless of the stage of breast cancer, IO care is low cost relative to conventional oncology costs. Standard cancer treatments may cost as much as \$10 000 to \$40 000 per month.^{10,11} These data are a necessary step toward the calculation of the cost-effectiveness of integrative oncology for breast cancer care as clinical outcome data become available over the next 4 years.

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