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The Yoga Mat, Where East Meets West: A Pilot and Feasibility Study Evaluating a Structured Yoga Practice on Common Side Effects of Chemotherapy/Biotherapy in Cancer Patients

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Categories: Original Research

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Background: Eight of the most commonly experienced physiological and psychosocial side effects of cancer chemotherapy/biotherapy are pain, tiredness, drowsiness, nausea, lack of appetite, shortness of breath, depression, and anxiety. Yoga is a complementary health

approach recognized by the National Institutes of Health.

Objectives: To evaluate the effects of a structured yoga program on specific physiological and psychosocial side effects in patients undergoing active treatment with chemotherapy/biotherapy.

Methods: This quantitative, nonexperimental pilot study with anecdotal commentary utilized descriptive statistics. Participants (N = 8) self-rated these side effects using a validated instrument at 10 points during an 8-week structured yoga intervention. Effect size and means were calculated at select data points: baseline, week 8, and 1 month after study completion.

Results: Reported ratings demonstrated improvement in many symptoms at week 8, and an increase in some of these symptoms' recurrence 1 month after study completion. Interestingly, participants' self-report of overall well-being demonstrated a positive improvement. Effect size was calculated: Cohen's d of 0.56 measured from baseline to week 8 yielded a medium effect size, and Cohen's d of 0.36 measured from week 8 to poststudy completion yielded a small effect size.

Conclusions: Participants in a structured yoga program reported a decrease in many of the negative side effects of chemotherapy/biotherapy and improvement in feeling of overall well-being. Limitations of this study included variability of cancer diagnoses, sample size, and consistency of class attendance. Yoga can be one of many supports offered by the oncology nurse navigator.

Cancer is the second leading cause of death in the United States.[1] More than 1.7 million people were expected to be diagnosed with cancer in 2018.[2] New York State residents comprised almost 110,000 of those,[3] with roughly 500 residing in the county of the study.[4] Treatment for many of the early-stage cancer patients consisted of surgery alone, or combined surgery and radiation therapy. Others were treated with a combination of therapies, including chemotherapy, biotherapy, and/or immunotherapy.[5]

Cancer chemotherapy can be administered via IV infusion or in pill form. Regardless of the route of administration, these agents cause physiological side effects that will be experienced, to some extent, by all patients. The diagnosis of cancer at any stage can have psychosocial effects of depression and anxiety, and those diagnosed with metastatic disease experience the added psychological burden of knowing their disease is incurable and life-limiting. Research continues to produce novel therapies to cure or palliate cancer, but no conventional cancer therapy is without side effects.

Oncology nurse navigators (ONNs) understand the importance of keeping treatments on schedule and patients out of the emergency department or hospital. Supportive care is important when side effects may delay treatment, and ONNs may need to consider

nontraditional options to support their patients through difficult treatment regimens.

Eight well-known physiological and psychological side effects of cancer and chemotherapy/biotherapy are pain, tiredness (lack of energy), drowsiness (feeling sleepy), nausea, lack of appetite, shortness of breath, depression, and anxiety. Conventional treatment usually requires medication, often including opioids. Considering the opioid crisis in the United States, government agencies and practitioners are looking at other supportive approaches that will reduce the risk of addiction.[6] Complementary therapies, defined as non-mainstream practice used in conjunction with conventional medicine, are the subject of clinical trials.[7]

The practice of yoga originated in India about 5000 years ago as a spiritual discipline to alleviate suffering, or "disease." "Yoga," from Sanskrit, means to "yoke" or "unite." The practice of coordinated breathing (pranayama), movement (asana), and meditation (dhyana) is said to unify the body and the mind, promote well-being, and reduce stress.[6]

The National Institutes of Health's National Center for Complementary and Integrative Health[7] and the Oncology Nursing Society (ONS) both recognize yoga as an important therapy. ONS guidelines list yoga as an intervention that is "most likely effective" for fatigue and anxiety. It has also been studied as an intervention to deal with depression, chemotherapy-induced nausea and vomiting, hot flashes, cognitive impairment, sleep-wake disturbances, pain, and fatigue in patients with cancer.[6]

This study community is home to several yoga studios, offering a variety of yoga practices and classes. A patient shared with the ONN that there was a structured yoga class for cancer survivors offered in the community. The yoga instructor was contacted and asked to lead a class for one of the support groups offered through the local cancer center. The "demonstration class" had 15 participants of various ages and cancer diagnoses, all in the posttreatment survivorship phase. The question arose, "How might this practice affect cancer patients in active treatment?"

Review of the Literature

A review of the literature was conducted to understand the impact of the intervention of yoga on psychological and physical effects of chemotherapy/biotherapy on patients in active treatment. Results were robust, supporting the intervention's positive impact on psychological effects. However, the literature overwhelmingly indicates a need for continued research of the impact on the physical effects.[8,9]

One systematic review evaluated results from 12 nonrandomized controlled trials and 12 randomized controlled trials in which improvement in depression, anxiety, distress, sleep, and fatigue was seen. Findings related to quality of life were inconclusive due to a lack of

specificity in the improvements domain, specifically physical, social, or cancer diagnosis.[9] The review highlighted the need for improved research methodology to inform clinical practice guidelines.[9]

A recent systematic review found yoga yielded positive psychological and physical outcomes in patients undergoing active treatment, but also emphasized the need for well-designed trials to study the physical outcomes.[8] The review pointed to a lack of structured yoga programs specifically designed for persons undergoing cancer treatments.[8]

One qualitative study explored people's experience with yoga as a complement to conventional cancer treatment. Themes included perceived benefits of the yoga intervention, reasons and motivation for practicing yoga, barriers to practicing yoga, and advice for more effective, structured yoga program delivery.[10] Participants expressed their need to be involved in the treatment of their disease and the restoration of their health.[10]

Theoretical Framework

Dorothea Orem's Theory of Self-Care, a subset of her Self-Care Deficit Theory, provided the framework for this study. The theory assumes that individuals engage in activities on their own behalf to improve their health and wellness.[11] The conceptual elements are self-care, self-care agency, and self-care requisites.[12]

Self-care is defined as the action taken by an individual to engage in activities and behaviors to promote personal health and wellness. Self-care agency is the ability of the individual to engage in self-care within the context of their current life conditions, including current illness, available resources, and physical abilities. The 3 self-care requisites are maintenance of basic life functions (activities of daily living), appropriate developmental state, and ability to adapt to a deviation from the usual state of health.[12]

As related to this study, these elements are expressed in the participants' motivation for engaging in the yoga intervention. Self-care was demonstrated through the choice to participate in the structured yoga program. Self-care agency was demonstrated through the desire to engage in self-care, despite undergoing cancer treatment and coping with related side effects. The health deviation requisite was fulfilled through the awareness of the disease and effects of treatment on their usual state of health. Completion of a validated tool prior to each class allowed a focused self-assessment to reflect on their disease status, treatment, and perceived effects of the previous yoga session.

Methods

The specific aim of this study was to evaluate the effects of a structured yoga program on the physical and psychological side effects of treatment in cancer patients undergoing chemotherapy or biotherapy. Based on the findings of the literature review, it was

hypothesized that participants would report a decrease in the negative side effects of chemotherapy/biotherapy and an increase in their overall feeling of well-being while participating in the yoga intervention. A reverse in this trend was anticipated once the participants were no longer engaged in the yoga portion of the study. It was hypothesized that participants would report a change in their use of medications for pain, nausea, and anxiety.

A secondary aim was to determine the feasibility of offering this structured yoga program as a complement to standard therapy for this patient population. The cost of classes offered in the community could be prohibitive for patients already experiencing financial strain or toxicity from the burden of treatment costs. However, if the study showed a positive impact on the participants, financial support for classes might be possible through the community. The goal would be to offer the yoga program to all local cancer survivors.

The study design was quantitative, utilizing descriptive statistics and anecdotal commentary. The validated tool was a combination of a focused self-assessment survey, the Edmonton Symptom Assessment System-revised (ESAS-r) (**Figure 1**), a rudimentary drawing of a body to indicate location of pain; an area to denote changes in the use of pain, anxiety, or nausea medications; and a section for comments.

Figure 1 ESAS-r

Edmonton Symptom Assessment System:
(revised version) (ESAS-R)

THE University of Vermont HEALTH NETWORK
Champlain Valley Physicians Hospital

Please circle the number that best describes how you feel NOW:

No Pain	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Pain
No Tiredness *(Tiredness = lack of energy)*	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Tiredness
No Drowsiness *(Drowsiness = feeling sleepy)*	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Drowsiness
No Nausea	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Nausea
No Lack of Appetite	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Lack of Appetite
No Shortness of Breath	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Shortness of Breath
No Depression *(Depression = feeling sad)*	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Depression
No Anxiety *(Anxiety = feeling nervous)*	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Anxiety
Best Well-being *(Well-being = how you feel overall)*	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Well-being
No _____ Other Problem *(for example constipation)*	0	1	2	3	4	5	6	7	8	9	10	Worst Possible _____

Participant's ID _____
Date _____ Time _____

Completed by (check one):
☐ Patient
☐ Family caregiver
☐ Health care professional caregiver
☐ Caregiver-assisted

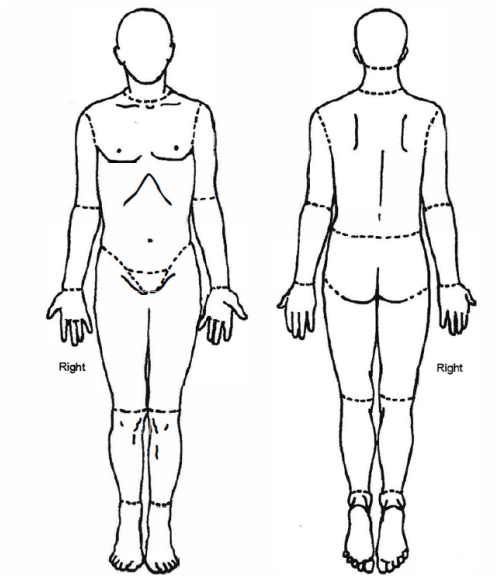
BODY DIAGRAM ON REVERSE SIDE

ESAS-r
Revised: November 2010. Used with Permission.

Figure 1 ESAS-r *(continued)*

Please mark on these pictures where it is that you hurt:

Participant's ID#: _____
Date: _____



Has there been a change in how often you are taking medications for:
Pain _____ Nausea/Vomiting _____ Anxiety _____ Appetite _____
Additional Comments:

Additional questions (not part of ESAS-r)

ESAS-r indicates Edmonton Symptom Assessment System-revised.

The study was presented to and received approval from the Institutional Review Board. The cost of the classes and equipment for individual use was underwritten by the Foundation of the institution. A quiet space was provided within the institution for the weekly classes.

Recruitment

Printed materials and individual discussion were utilized to introduce the study to potential participants. Informational posters, flyers, and brochures were displayed throughout the cancer center. The principal investigators (PIs) spoke to established patients receiving treatment in the infusion area and made telephone calls to patients on oral chemotherapy. New patients were introduced to the study at their "Chemo Class," the education session before starting chemotherapy and/or biotherapy treatments. Nurses and staff were asked to direct interested parties to one of the PIs for education, discussion, and enrollment in the study.

Participants were recruited based on interest from the recruiting materials or conversation with medical providers, and meeting eligibility criteria. The PIs facilitated medical clearance from the necessary providers, then contacted the interested patient. The study was explained in detail, and the informed consent was signed. A number was assigned to the participant and written on the informed consent to de-identify and code participants.

The study was planned as a pilot and feasibility study; therefore, no power analysis was performed. The recruitment time frame was intentionally limited to a 3-week period due to weather and travel concerns during the 8-week intervention period.

Sample

Inclusion criteria allowed enrollment of adults of any gender between the ages of 18 and 80 years with a diagnosis of any cancer undergoing conventional treatment of chemotherapy/biotherapy at the institution of study. Medical clearance was required. Participants were to receive treatment through at least 6 of the 8 weeks of the study. Those not meeting the inclusion criteria, or undergoing concurrent radiation therapy, were excluded. However, 1 participant exceeding the age limit expressed interest in the study, received medical clearance from providers, and was enrolled. The upper age limit of the inclusion criteria was not an evidence-based limitation; it was a mistaken assumption that patients older than 80 years would not be interested in participating. There is no age limit to self-care agency, and participation in health and wellness activities should be encouraged throughout the life span.

It was also surmised that, given the range of disease processes, stages, and treatment schedules, participants would be unable to attend all sessions. This was the reality of life for the study population, but it was assumed there was value in this intervention for each participant. The PIs allowed for this variability and planned to use data from participants who attended at least 4 of the sessions.

A convenience sample of 15 men and women receiving chemotherapy and/or biotherapy at the outpatient cancer center at the institution of study was enrolled. Five were lost to attrition for various reasons early in the study, leaving a final cohort of 10. The sample comprised self-identified Caucasian males and females. Ages varied greatly, with a span of 59 years between the youngest and the oldest. The mean age was 57.7 years. Seven participants had metastatic disease. Five of the participants received infusional chemotherapy, and 5 received oral chemotherapy.

Intervention and Data Collection

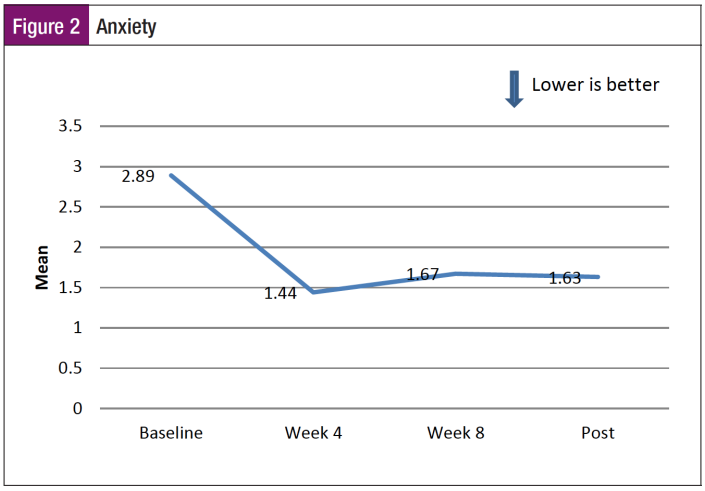
The intervention consisted of 8 weekly 1-hour structured yoga classes taught by an instructor certified in the specific yoga practice. Participants were encouraged to participate to their level of comfort. Necessary supplies and equipment for individual use were provided: 1 yoga mat, 2 blocks, 1 strap, 1 bolster, and 2 blankets. Some participants used chairs instead of standing or using the yoga mat and focused on breathing. Some used the blocks and bolster to maintain balance and comfort. Others were able to achieve all poses without assistance. The PIs observed that abilities and endurance varied from week to week.

All participants completed a focused self-assessment using a validated tool, the ESAS-r. Pain, fatigue, nausea, depression, anxiety, drowsiness, appetite, shortness of breath, and feeling of overall well-being were assessed at 10 intervals: at baseline (when signing the informed consent), before each of the 8 classes, and 1 month after the last class. Participants had the opportunity to identify areas of pain/discomfort on a body diagram, and to offer comments regarding their use of medications to manage pain, nausea, and anxiety, and any other comments they wished to share.

Findings

The study design was quantitative with anecdotal comments captured on the ESAS-r. Anecdotal comments and the body diagram were analyzed for common themes regarding the intervention and use of medications.

Descriptive analysis was performed (N = 8). Aggregate means of individual ratings were calculated at baseline, week 4, week 8, and 1 month after yoga intervention for each symptom assessed. A reduction in any symptoms during the intervention period and an increase 1 month after completion were anticipated. There was a decrease in nausea from baseline (M = 1.13) to postintervention (M = 0.5). Decreases in pain, shortness of breath, and depression were not demonstrated at the points measured. Anxiety decreased from baseline (M = 2.89) to week 4 (M = 1.44), increased at week 8 (M = 1.67), then decreased slightly postintervention (M = 1.63) (**Figure 2**). As seen in Figure 3, there was a decrease in ratings of tiredness, lack of appetite, drowsiness, and well-being from baseline at week 4 and week 8, and an increase postintervention. Lower ratings demonstrated improvement in symptoms based on ESAS-r (0 = best, 10 = worst). These results support the study's hypothesis.



Due to treatment schedules, hospitalizations, and previously planned "life-affirming" events, only 2 participants were able to attend all 8 yoga sessions. Because of the extremely small sample and inability to achieve statistical significance, effect size was calculated to further understand the size of the impact of the intervention on the participants. Effect size was calculated at baseline, week 8, and 1 month after completion for each of the side

effects evaluated on the ESAS-r (**Table 1**). Effect size is determined by calculating the mean of comparison groups and dividing by the standard deviation. Effect size values are correlated to a standard measurement, Cohen's d, which is then used to compare the calculated effect size values.

Table 1 Effect Size

Side Effect	Cohen's *d*, Baseline to Week 8	Effect Size, Baseline to Week 8	Cohen's *d*, Week 8 to Post	Effect Size, Week 8 to Post
Pain	0.39	Small/Medium	0.74	Medium/Large
Tiredness	1.22	Very Large	1.21	Very Large
Drowsiness	0.71	Medium	0.88	Large
Nausea	0.33	Small/Medium	0.18	Very Small/Small
Lack of appetite	0.28	Small	0.20	Small
Shortness of breath	0.20	Small	0.26	Small
Depression	0.62	Medium	0.33	Small
Anxiety	0.47	Small/Medium	0.23	Small
Well-being	0.56	Medium	0.36	Small

A standard qualitative analysis was not performed, but anecdotal comments were divided into themes, then sorted into categories by symptom and further defined and sorted as "positive," "negative," "neutral," and "mixed." Standardized definitions were used to categorize comments in a structured, unbiased manner. Forty of the comments were defined as positive, 1 as negative, 10 as neutral, and 6 as mixed. Of the 40 positive comments, 26 reflected perceived improvement in feeling of overall well-being. The 1 negative comment was not related to the study or intervention.

Physical themes were related to gastrointestinal and digestion symptoms, reduction in pain, and improved sleep. Psychological themes included reduction in anxiety, acceptance of diagnosis, and enjoyment of the group dynamics and camaraderie. Comments such as "It feels like I'm participating in my cancer treatment" and "I feel very relaxed, comfortable and have a feeling of well-being" are highly representative of the anecdotal commentary and strengthened support for the secondary aim. Pain reduction was the second major physical theme, although this was not reflected through the analysis of the ESAS-r. Participants frequently commented on reduced anxiety and ability to control stressors outside of the yoga class (**Table 2**).

Table 2 Representative Comments

Comments: Week 4 to Week 8
I look forward to yoga. I feel relaxed, and my body overall feels better after I do it.
I always feel wonderful after class and for a couple days after.
Love this class – Great both mentally and physically.
This class should be offered to all cancer patients. There are benefits both mentally and physically.
Noticeable improvement w/digestive issues...still improved sleep.
Sleep good. Digestive issues still improved.
After class I feel calm, I sleep better. By Wednesday/Thursday I am ready and craving for more yoga and deep breathing. My hips tend to get sore from stretching them. Yoga is giving me a clearer mind to make better decisions. Positive emotional health!
…I really appreciated the class. It helped me to accept myself for who I am. It was something special to help with my healing.
I feel better than I should feel at this stage of cancer.
I find I have a lot more energy when I get home. My flexibility has improved greatly. I feel my overall attitude has improved.
My pain while bending has mostly been resolved. I have found the breathing techniques extremely beneficial.
Comments: Week 8 and Post
I was more relaxed, emotionally, when I was doing yoga.
My doctor stopped my chemo…Pain has gotten worse, and flexibility has gotten worse. I didn't feel like this when I was taking the yoga class. It helped me physically, emotionally, and spiritually. It's like group therapy. The other participants made it a great experience. We were all going through the same thing.
I get lazy when I stay home – if I get out, I feel better about myself. I hope you bring yoga back so I have a reason to get out. Thank you.
Thank you for having this class. I feel good about myself and seeing other people who have the same problem that I have. Thank you.

Discussion

As hypothesized, a decrease was noted in a majority of symptoms from baseline to week 8, with an increase at the postintervention data point. It is noted that anxiety did not increase as anticipated at the postintervention data point. This was unexpected but understood through participants' comments.

It would be difficult to infer that the yoga intervention was positively correlated to the decrease in negative side effects, if not for the anecdotal commentary. The comments were overwhelmingly positive regarding the impact of yoga. However, the themes of "shared experience" and "camaraderie" that emerged were unanticipated. This highlights the effectiveness of the structure of the yoga intervention and the benefit of offering a class specific to this population that meets their unique physical, emotional, social, and educational needs.

Strengths and Limitations

Strengths of this study include the use of a validated tool for measurement of symptoms, and a structured approach to the yoga intervention. A certified yoga instructor and structured yoga program specifically designed for people with cancer was chosen because of the unique needs of the population.

Limitations included the single-site descriptive design of the study and extremely small sample size. Inconsistent attendance by most participants was an expected limitation, as was the variability of diagnoses and treatment schedules. Anecdotal commentary was limited, as written comments were collected before each class. Comments were not verbalized and recorded, and this may have limited the free flowing of ideas by participants. The study was not initially designed for qualitative analysis, yet valuable themes were uncovered on review of the anecdotal commentary. Further studies would benefit from a more rigorous study design.

The primary goal was to determine the feasibility of supporting this program in the community. Although there were many limitations to the study as a result of the design, and statistical significance was not obtained, the feasibility of implementing a structured yoga program was better understood. This study resulted in the establishment of philanthropic support for a structured yoga program for people with cancer in the local community that is co-managed by the organization's Foundation and a partnering yoga studio. Philanthropic support is ongoing to support the program and will be reviewed periodically.

Conclusions and Implications for Practice

The implications for practice are far-reaching and exciting. This complementary therapy offers patients undergoing conventional therapy an opportunity to participate in their treatment in a manner that affects not only the physical aspects of illness but also the psychological aspects of wellness. This yoga practice is beneficial for people with any cancer, in any stage. The ability to adapt the poses to meet the physical abilities of the participants affords them the opportunity to participate in a self-care yoga activity with others undergoing a similar life-changing experience. Yoga is a personal, yet shared, experience meeting their unique needs.

All participants were able to experience some degree of benefit, regardless of age or physical ability. This is especially important to patients with metastatic disease, for whom conventional treatment options may be limited. Even patients with diminished ability to engage in self-care activities can use controlled diaphragmatic breathing at any time, in any place, and at no cost, as a tool to help relieve anxiety or stress. Gentle movement may aid in the relief of muscle tension, stimulate lymphatic drainage, improve range of motion, increase strength, and improve balance. Mindfulness, meditation, and guided imagery may help to reduce anxiety and promote relaxation. These gentle practices of yoga "unify" mind and body and may promote psychological healing as well. As one participant stated after the first yoga intervention, "I hadn't realized I had not accepted my cancer."

Important conversation was opened between patients and providers to consider yoga as a complement to conventional therapy. Discussion continued beyond the patient-provider relationship into the local community, and this yoga practice is now a known resource for people with cancer at any stage of the continuum. The local community has embraced this concept with support and funding; there has been an increase in the number of certified yoga providers for this specific yoga practice, and an increase in the availability of classes offered.

It is hoped that this study, despite its limitations, will open conversations among ONNs, oncology providers, community yoga providers, and the people they care for.

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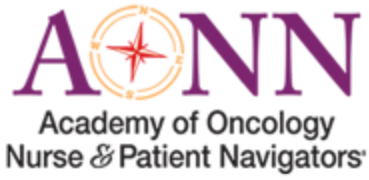

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