Efficacy of Inhaled Essential Oil Use on Selected Symptoms Affecting Quality of Life in Patients With Cancer Receiving Infusion Therapies

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OBJECTIVES: To evaluate the effects of inhaled ginger, German chamomile, and bergamot essential oil (EO) versus an odorless control oil on appetite, anxiety, fatigue, and nausea in individuals with cancer receiving IV therapy.

SAMPLE & SETTING: 248 adults with gastrointestinal, neuroendocrine, or skin cancer receiving IV therapy from an academic cancer center.

METHODS & VARIABLES: Participants were randomized to EO or control oil groups. Participants rated their symptoms during a seven-day period using a Likert-type scale ranging from 0 (no symptoms) to 10 (worst symptoms ever).

RESULTS: Symptom burden was low. More men than women completed the study. The majority of participants had gastrointestinal cancer, followed by skin and neuroendocrine cancer. Ginger EO produced statistically significant results for anxiety and fatigue.

IMPLICATIONS FOR NURSING: Most participants were men and had gastrointestinal cancer. The high number of zero scores for symptoms may indicate the success of current symptom management regimens. Improvements in anxiety and fatigue using ginger EO warrant further study for validation.

KEYWORDS cancer; aromatherapy; essential oil; fatigue; nausea; anxiety

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Cancer treatment can cause distressing symptoms, including decreased appetite, anxiety, fatigue, and nausea. In many patients, these symptoms adversely affect quality of life (QOL) and contribute to decreased adherence to treatment regimens. Infusion therapies, such as chemotherapy and biologic agents, are administered on a dosing schedule to optimize their anticancer effect. Managing symptoms ensures patient adherence to the dosing schedule. Pharmacologic management of symptoms can potentially lead to additional side effects such as sedation, constipation, and nausea. Going to the infusion clinic may even cause anticipatory symptoms for some patients.

Complementary therapies have become more popular and are requested by patients who seek nonpharmacologic interventions to improve their QOL (Robison & Smith, 2016). Aromatherapy may be a low-risk treatment that oncology nurses can introduce to patients with cancer for self-management of symptoms. Further exploration is warranted into the effects of inhaled essential oil (EO) on symptom relief for patients undergoing infusion therapies for gastrointestinal, neuroendocrine, and skin cancers.

Background and Significance

Many studies that have evaluated the use of inhaled EO in patients with cancer focus on breast cancer, and fewer studies have examined the use of EO in patients with gastrointestinal, neuroendocrine, and skin cancers. Of the digestive organs involved in gastrointestinal cancer, colon and rectal cancer have the highest incidence (National Cancer Institute, 2021). The incidence of neuroendocrine tumors was

6.98 cases per 100,000 in 2012, and evidence suggests an increase in the incidence of gastrointestinal and neuroendocrine cancers (National Comprehensive Cancer Network [NCCN], 2022). In addition to nonmelanoma cancers, skin cancers in general remain commonly diagnosed. Invasive melanoma is reported to account for 1% of all skin cancers, with 99,780 new cases and 7,650 deaths in 2022 (American Cancer Society, 2022). Rapid progress has been made in treating advanced melanoma, yet little is known about the treatment of QOL issues (Cheung et al., 2019). Symptom management for these cancer populations remains important to research and adds to the current literature.

Unpleasant symptoms and side effects that affect QOL arise from cancer and its treatments. Cancer treatments have evolved and become more personalized, producing greater relief from side effects and increasing life expectancy. However, the literature reports that treatment side effects, such as decreased appetite, anxiety, fatigue, and nausea, continue to contribute to decreased QOL (Bilgiç & Acaroğlu, 2017; Chi et al., 2014). Inhaled EOs (e.g., ginger, chamomile, bergamot) have been studied for their effects on the relief of these symptoms, as well as on patient well-being and QOL. The purpose of this study was to evaluate the effects of EO use on the level of distress caused by select unpleasant symptoms. Two components of the Theory of Unpleasant Symptoms, specifically individual unpleasant symptoms and level of distress, served as the theoretical framework for this study, making it feasible as clinic nurse–conducted research (Blakeman, 2018; Lee et al., 2017; Lenz et al., 1997; Schreier et al., 2019).

Appetite

Weight loss is a predictor of patient nutritional status and is linked to the length of survival (Bender et al., 2002). Decreased appetite is a precursor to anorexia and cachexia. Nausea has been directly linked to appetite, but the effect of anxiety on appetite is still unclear (Marinho et al., 2017). Oncology nurses and nutritionists can offer encouragement and suggestions to help patients eat even when they are not hungry. Prescription medications may improve appetite, but there is no standard-of-care treatment for decreased appetite (Chi et al., 2014).

Anxiety

Anxiety is a side effect that can be debilitating if it is not well managed. Kyle (2006) found that 25%–35% of people with cancer experienced anxiety or depression throughout their cancer care, and that anxiety endured even into the palliative care phase. In a study of 254 patients, 28% reported scores that indicated mild to severe anxiety on the Hospital Anxiety and Depression Scale (Mayer et al., 2017). Management of anxiety, which is a risk factor for nausea, should begin before the initiation of cancer treatment (Vanbockstael et al., 2016). Anxiety treatment methods include pharmacologic, psychologic, and complementary therapies. However, some prescription medications (e.g., citalopram, lorazepam) can cause side effects, such as sedation, delirium, agitation, and fatigue, among others, leading to a decrease in QOL (IBM Micromedex, 2018a, 2018b). Managing anxiety with nonpharmacologic methods can potentially improve patients' QOL. Research has shown that aromatherapy using EOs can decrease anxiety and increase QOL in people receiving chemotherapy (Ozkaraman et al., 2018).

Inhaled bergamot EO has been found to decrease anxiety in presurgical patients (Ni et al., 2013). A randomized controlled trial by Ni et al. (2013) compared the effect of inhaled bergamot EO to that of an inhaled control (water vapor) for people who suffered anxiety before undergoing surgery. In the bergamot EO groups, anxiety reported by patients, including those with prior surgery experience and those without prior surgery experience, showed a significant decrease from baseline.

Srivastava et al. (2010) reported that chamomile EO may be beneficial in improving diverse symptoms, including anxiety, gastrointestinal conditions, and nausea. In the conclusion of their review, the authors acknowledged that there is a need for further research to establish potential therapeutic effects of chamomile EO on patients.

Fatigue

Fatigue is a distressing symptom that may span the continuum of a patient's cancer care. In one study, patients with colorectal cancer reported greater fatigue than healthy controls, and fatigue in those receiving cancer treatments was even more severe (Vardy et al., 2016). A study of QOL in cancer survivors who had undergone pancreatectomy for different types of pancreatic cancer, including pancreatic neuroendocrine tumors, found symptoms with the highest occurrence were fatigue, back pain, and difficulty with digestion (Cloyd et al., 2017). In a qualitative study examining individuals with melanoma, fatigue was the most reported symptom across multiple lines of treatment, followed by nausea (Cheung et al., 2019).

Although studies have looked at treatment options for fatigue alone, none have looked at the combined effects of nausea and anxiety on fatigue.

Nausea

In 2002, Bender et al. found that nausea and vomiting were underaddressed and underreported. In the intervening decades, management of nausea has improved considerably. Oncology healthcare providers recognize that nausea can lead to vomiting and decreased appetite, which may have a debilitating effect on QOL. However, some antiemetics can cause side effects, including constipation, headaches, tremors, and seizures (Hickson, 2015; Navari & Aapro, 2016), leading patients who experience nausea to search for other ways to manage their symptoms and enhance their QOL.

For patients with breast cancer, inhaled ginger EO has been found to provide a statistically significant decrease in nausea and appetite loss during the eight days following chemotherapy treatment (Lua et al., 2015). Toniolo et al. (2021) conducted a systematic review of 11 studies on the use of EOs for nausea; nine studies focused on adults with cancer, and two focused on children with cancer. Methodological limitations of the reviewed studies included variations in EOs, differences in dosage and delivery method of EOs, different cancer types, and sample groups composed predominantly of female participants with breast or gynecologic cancers. In a systematic review, studies on administration by direct inhalation of ginger EO (n = 3) and chamomile EO (n = 1) were notable for having statistically significant results (Toniolo et al., 2021).

Safety of Essential Oils

Aromatherapy is a broad term that can include massage and the use of aromatic oils that are not EOs. For example, Tayarani-Najaran et al. (2013) examined how ingesting capsules containing spearmint and peppermint EOs affected nausea in patients with cancer. In the current study, only the use of inhaled EOs was investigated.

Direct inhalation is a common method of administering EOs (Ohio State University Wexner Medical Center, 2019). When inhaled, EOs go directly to the lungs, bypassing the liver. Because the lungs are large and have a rich blood supply, inhaled compounds can pass from the air into the body systems.

Adverse effects of common EOs are infrequent and generally mild (Ramsey et al., 2020). A challenge in EO research is the definition of a consistent dose. Kiecolt-Glaser et al. (2008) used two drops of EO on a cotton ball taped to the area between the nose and upper lip of each participant to provide "continuous and uniform exposure." Tisserand and Young (2014) explored dosing recommendations and the overall safety of inhaled EOs. The authors noted that prolonged exposure (greater than 30 minutes) to high levels of the EO vapors may increase the risk of adverse effects.

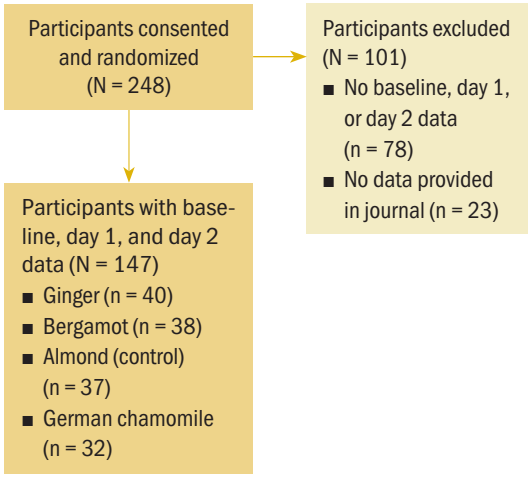
As described by Kyle (2006), sweet almond oil, which is a non-volatile, almost odorless oil, was used for the control group in this study. Because almond oil is easily oxidized, it was kept in a cool, dark place (Tisserand & Young, 2014).

This study used a bergamot EO that was rectified and free of furanocoumarins (Plant Therapy, 2018). There are no known hazards associated with the use of furanocoumarin-free bergamot EO. The EO bottle was stored in a cool, dark place to prevent oxidation. German chamomile EO has no known inhalation hazards; however, if ingested, it can interact with drugs metabolized by cytochrome P450 2D6. Ginger EO also has no known inhalation hazards and no contraindications (Tisserand & Young, 2014).

Objectives

The primary objective of this study was to evaluate the effects of inhaled ginger EO, German chamomile EO, and bergamot EO on the selected symptoms appetite, anxiety, fatigue, and nausea in patients receiving IV chemotherapies and biologic agents. The secondary objective was to evaluate participants' acceptance and use of a personal inhalation bottle (PIB) for administration of EOs.

FIGURE 1. Study Enrollment



Methods

Design

This single-blind, randomized controlled study investigated aromatherapy in the form of inhaled EOs. All participants continued their prescribed standard-of-care symptom management regimen and supportive care for their cancer type based on guidelines from NCCN (2021a, 2021b).

Sample and Setting

From November 2018 to March 2020, patients undergoing treatment at the Arthur G. James Cancer Hospital and Richard J. Solove Research Institute at the Ohio State University in Columbus were informed about this nurse-led study. The patient population included those with gastrointestinal, neuroendocrine, and skin cancers. A total of 248 patients with cancer consented to participate (see Figure 1). Eligible participants were aged 18 years or older, were able to read and write English, and had received at least one dose of IV infusion therapy for gastrointestinal, neuroendocrine, or skin cancer. Participants were excluded if they had an asthma diagnosis; a known pregnancy; or allergies to ragweed, chrysanthemum, chamomile, ginger, bergamot, citrus fruits, tree nuts, or perfumes. This study was reviewed and approved by the Cancer Institutional Review Board at the Ohio State University.

The original sample size goal was 60 or more participants randomized to each of the four arms. If this sample size were achieved, based on standard deviation estimates from Lua et al. (2015), it was expected that the smallest between-group differences detectable with at least 80% power and a false positive rate of no more than 5% would be 1 unit on the 11-point symptom-level scale, which would be considered a clinically relevant difference.

Procedures

Patients were referred to the study team by ambulatory oncology nurses from the gastrointestinal, neuroendocrine, and skin cancer clinics. Infusion clinic schedules were prescreened to determine eligibility, and study team members approached patients who were eligible to participate in the infusion clinic. The study was described, questions were answered, and consent was given. After obtaining consent, an electronic research database was used to randomize participants to one of three EOs (bergamot, German chamomile, or ginger) or the control oil (almond).

After randomization, an EO PIB with seven drops of the assigned oil on a cotton ball was distributed to each participant. The PIB consisted of a three-ounce, opaque, bisphenol A-free plastic bottle with a snap-on snifter lid. A study team member reviewed the process for using the PIB, which required turning the snifter lid to open, squeezing the bottle, inhaling the aroma, and repeating the process at three time points (morning, noon, and evening) for seven days. Participants documented their level of distress with lack of appetite, anxiety, fatigue, and nausea symptoms in a journal created for the study.

Measures

The preprinted, seven-day journal contained daily symptom self-assessments for appetite, anxiety, fatigue, and nausea. The symptoms were evaluated on a Likert-type scale ranging from 0 (no symptoms) to 10 (worst symptoms ever). The time of

TABLE 1. Sample Characteristics by Treatment Group (N = 147)

	Ginger (N = 40)		Chamomile (N = 32)		Bergamot (N = 38)		Almond (N = 37)	
Characteristic	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Age (years)	65.2	11.9	63.1	9.9	61.7	12.5	60.8	11.6
Characteristic		n		n		n		n
Gender								
Male		26		18		25		23
Female		14		14		13		14
Cancer diagnosis								
Gastrointestinal		30		25		27		31
Melanoma		10		7		9		6
Neuroendocrine		–		–		2		–

TABLE 2. Descriptive Statistics for Baseline-Corrected Symptom Scores by Treatment Group (N = 147)

	Ginger (N = 40)			Chamomile (N = 32)			Bergamot (N = 38)			Almond (N = 37)		
Symptom	$\bar{X}$	M	Range	$\bar{X}$	M	Range	$\bar{X}$	M	Range	$\bar{X}$	M	Range
Anxiety	−0.2	0	−3 to 2.4	−0.2	0	−3.4 to 2.5	0.1	0	−2 to 7	0.1	0	−6.5 to 5.3
Appetite	−0.4	0	−8.6 to 3.1	0.4	0	−4.2 to 7	−0.1	0	−6.6 to 7.8	0.4	0	−5.8 to 7
Fatigue	−0.8	−0.5	−6 to 3.2	−0.5	0	−4.8 to 4.1	−0.1	0	−6.7 to 5.4	0.3	0	−8 to 6.5
Nausea	0	0	−7 to 3.1	1.3	0.4	−3.9 to 7.7	0.4	0	−4.8 to 4.5	0.7	0	−4.6 to 7.7

M—median
Note. The range of the symptom-level data is not bounded below by 0. If a patient's baseline symptom level was greater than a daily score, the baseline-corrected score for that day was negative.

inhalation (morning, midday, evening) and prescription medications taken for symptom relief were also documented. On the day of randomization, the participant return-demonstrated documentation of their symptoms in the journal, which served as the baseline data. Days one through seven of data collection began the following morning. At the end of the seven days, participants completed evaluation questions about the use of the EO and the PIB, and possible future use.

Participants were instructed to return the seven-day journal at their next oncology appointment. They were also instructed to stop inhaling the EO and to contact the principal investigator if they experienced itching, sneezing, shortness of breath, or other symptoms when using the EOs or PIBs. If symptoms did not improve after stopping use or if they had concerns about other symptoms, they were instructed to contact their oncologist for follow-up care.

Data Analysis

Quality-of-life symptoms: All data were analyzed using SAS, version 9.4. The distribution of symptom data was skewed, with many zeros. Nonparametric methods were used to test for treatment group differences, namely Wilcoxon rank-sum tests. The following data transformations were performed. A daily symptom score was calculated for each participant by averaging the three daily symptom measures. The baseline score was subtracted from each of the seven daily scores. Then, the seven baseline-corrected daily scores were averaged. After the seven scores were averaged, each participant had one symptom-level score for each symptom.

For each symptom, Wilcoxon tests were performed to compare each treatment group (bergamot, chamomile, and ginger) to the control group (almond). To account for multiple testing, the p values were adjusted using the Šidák method. The probability that a randomly selected symptom level from a treated group was less than a randomly selected symptom level from the control group was used for effect size. The SAS macro NPTSD. SAS was used to estimate probabilities, as documented by Brunner et al. (2018).

Evaluation of PIB use: Because of skew in the data, Wilcoxon rank-sum tests were also used to test for group differences in responses to the evaluation questions. In the observed data, there appeared to be little difference between the average responses of the EO group participants. For testing, the EO groups were placed into one group. In other words, the composite responses of those using EOs were compared to those using the control oil.

Results

Results were analyzed for 147 of the 248 participants who consented to participate in the study. The attrition is explained by lack of participation after baseline assessment, lost journals, aversion to the smell of the EO, death before the end of the study, and adverse events. The unforeseen COVID-19 pandemic affected results analysis, and follow-up for participation and other attrition factors was beyond the capacity of the study team.

TABLE 3. Results of Wilcoxon Tests for Treatment Group Differences Based on Symptoms (N = 147)

Comparison	Adjusted p
Anxiety	
Ginger to almond	0.04*
Chamomile to almond	0.38
Bergamot to almond	0.81
Appetite	
Ginger to almond	0.94
Chamomile to almond	0.98
Bergamot to almond	0.99
Fatigue	
Ginger to almond	0.048*
Chamomile to almond	0.49
Bergamot to almond	0.62
Nausea	
Ginger to almond	0.98
Chamomile to almond	0.19
Bergamot to almond	0.99

* Significant at the $p < 0.05$ level
Note. To account for multiple comparisons for each symptom, the p values for the pairwise group test were adjusted using the Šidák method.

Sample characteristics were described using mean and standard deviation (age) and counts and percentages (gender and cancer diagnosis) (see Table 1). Participants were distributed among treatment groups as follows: ginger (N = 40), chamomile (N = 32), bergamot (N = 38), and almond (N = 37). Further evaluation of the 147 to describe complete data results for journal days 3–7 is reported by percentage: ginger (93%–98%), bergamot (82%–97%), almond (92%–95%) and German chamomile (81%–94%).

Predominantly older adults participated in this study. The mean age of participants across the four groups ranged from 60.8 to 65.2 years. There was a disparity in participation across genders, with more men participating than women (n = 92 and n = 55, respectively). The majority of participants had gastrointestinal cancer (n = 113), followed by melanoma (n = 32) and neuroendocrine cancer (n = 2). These numbers correlate with the general clinic population. Participant reporting was not equivalent across the three EOs and the control oil, with reporting from the chamomile EO group being the lowest. Further analysis showed that men (n = 18) in the chamomile group dropped out more frequently than the other groups (n = 26 in the ginger group, n = 25 in the bergamot group, and n = 23 in the almond group). The results do not provide detailed reasons for dropping out of participation other than feedback in the journal that chamomile "did not smell good." Four participants (1.6%) with no reported allergies had adverse events when using an inhaled EO. Participants reported that these symptoms stopped when they stopped using the EO.

Quality of Life

Table 2 provides summary statistics for the baseline-corrected symptom-level data by symptom and treatment group. The range of the symptom-level data was not bounded below by zero. If a participant's baseline symptom level was greater than one of the recorded daily scores, the baseline-corrected score for that day was a negative value.

The results of the Wilcoxon testing are summarized in Table 3. There were two statistically significant adjusted p values, both involving ginger. Apart from ginger, no other EO showed statistical significance at the $p < 0.05$ level. The results indicated that ginger decreased levels of fatigue ($p = 0.048$) and anxiety ($p = 0.04$). For anxiety, the probability that symptom levels when using ginger EO would be less than those when using almond oil was estimated to be 0.65 (95% confidence interval [0.54, 0.76]). For fatigue, the probability that symptom levels when using ginger

TABLE 4. Mean and Median Essential Oil and Personal Inhalation Bottle Use by Evaluation Item (N = 147)

Item	n	$\bar{X}$	SD	Median
Easy to use	141	4.3	1	5
Will continue to use	142	2.4	1.3	2
Helped with my symptoms	141	2.2	1.2	2

Note. Total scores range from 1 to 5, with higher scores indicating that the participant strongly agreed with the item.
Note. N values equal the number of responses of the total group. Participants could opt out of responding to items.

TABLE 5. Evaluation of Essential Oil and Personal Inhalation Bottle Use by Treatment Group (N = 147)

	Ginger				Chamomile				Bergamot				Almond			
Item	n	$\bar{X}$	SD	M	n	$\bar{X}$	SD	M	n	$\bar{X}$	SD	M	n	$\bar{X}$	SD	M
Easy to use	40	4.4	1	5	30	4.6	0.6	5	34	4.4	1.1	5	37	4	1.2	4
Will continue to use	40	2.5	1.3	2	31	2.3	1.5	2	34	2.4	1.1	2	37	2.3	1.5	2
Helped with my symptoms	40	2.4	1.1	2	31	2.2	1.2	2	34	2.5	1.2	2	36	1.9	1.2	1

M—median
Note. Total scores range from 1 to 5, with higher scores indicating that the participant strongly agreed with the item.
Note. N values equal the number of responses of the total group. Participants could opt out of responding to items.

EO would be less than those when using almond oil was estimated to be 0.66 (95% confidence interval [0.53, 0.79]).

Evaluation of Personal Inhalation Bottle Use

There was, on average, a high level of agreement with the statement that the PIB was easy to use. On average, there was some disagreement with the statements that the participants would continue using the device and that the EOs helped with symptoms (see Table 4).

Table 5 summarizes the distribution of the data from each evaluation item as a function of treatment. For each treatment, the pattern observed in Table 4 holds, namely, a high level of agreement that the PIB was easy to use and some disagreement with continued use of the PIB and that use of the PIB helped with symptoms. For "ease of use" and "help with symptoms," the lowest score was associated with the control group.

The results of the Wilcoxon tests are summarized in Table 6. Two statistically significant p values were reported. There was evidence that those using EOs found the device easier to use. Although device users typically had some disagreement with the statement that the device helped with symptoms, those using devices with EOs had less disagreement with this statement. There was no evidence that those using the device with EOs were more likely to continue using the device.

Discussion

This clinic nurse–led randomized controlled trial focused on the effect of EOs on patient-reported symptoms during IV infusion treatment for gastrointestinal, skin, and neuroendocrine cancers. Based on the literature, the EOs chosen had effects on nausea, anxiety, fatigue, and appetite in people with cancer and other populations (Chi et al., 2014; Lua et al., 2015; Srivastava et al., 2010). In this study, ginger affected fatigue and anxiety, but not nausea. The use of bergamot compared to almond oil did not affect anxiety, in contrast to findings reported in other research (Chi et al., 2014). There was no evidence that use of German chamomile EO affected symptoms, and the group using this EO had the highest voluntary stoppage.

The lack of anxiety, appetite, and nausea symptoms at baseline through the seven days after IV infusion treatment in this particular patient sample is of note. This may indicate that the current prescribed standard-of-care treatments for participants are effectively managing symptoms of anxiety, decreased appetite, and nausea that affect QOL. The results of this study required alternative statistical methods to establish the effects of EO and control oil on QOL symptoms. Allowing for numbers not bounded by zero permitted the use of calculation methods that could describe the clinical effect of EO administration.

Participants reported the PIB containing EOs was relatively easy to use and that the scent was maintained throughout the seven days. The daily journal had a section to comment on the EO PIB or the EO. A

TABLE 6. Results of Wilcoxon Test of Differences Between Those Using and Not Using Essential Oils (N = 147)

Item	p
Easy to use	0.004
Will continue to use	0.64
Helped with my symptoms	0.04

few statements included, "The bottle may be difficult to squeeze for an individual with decreased strength," "I did not see or feel any different during or after using this bottle," and "I did not like the scent in the bottle."

Power expectations were undermined by two unforeseen problems. Because of logistical problems, the study was terminated before the sample size goals were reached. Second, the power estimates assumed that analyses would make use of parametric models. The normality of the distributions of the symptom data was not tenable, with considerable skewing because of the presence of many zeros. For all but two of the comparisons, the estimated power was no more than 48%. The two comparisons with power greater than 48% involved ginger. For anxiety, the comparison of ginger to almond had an estimated power of 73%; for fatigue, the comparison of ginger to almond had an estimated power of 70%.

Attempts were made to accrue women to this study, yet participants were predominantly men (n = 92) with gastrointestinal cancers (n = 113). This sample population appears to be representative of the existing gender disparity in colorectal cancer incidence, with Gangireddy and Talla (2016) reporting an incidence rate of 35.7% in men to 29% in women for colon cancer and a rate of 16.2% in men and 10.1% in women for rectal cancer, respectively.

Strengths and Limitations

Large enrollment, being led by clinic nurses, funding, and organizational support were strengths of this study. The study enrolled 248 participants who were randomized equally across the three EO arms and one control oil arm. The number of people interested in and willing to participate led to a large sample size. Enrollment in this trial was a low-risk intervention for self-management of symptoms affecting QOL. This may support previous findings that complementary therapies have become more popular and requested (Robison & Smith, 2016).

A notable strength of this large, randomized controlled trial was that it was led by clinic nurses, with support from the organization. A statistician and graduate research assistants were available during the process. Clinical nurse specialists also provided mentoring and coaching. In addition, the institution and internal grant funding supported the study.

However, the study had notable limitations. First was the low symptom burden experienced by participants. Although reassuring regarding current symptom management regimens, it may also be attributed to self-selection by participants in the study. Confounding this were data reflecting that many participants did not complete the study. Data collected in the study did not indicate the reason for attrition of the participants.

Second, the study had to be stopped because of the COVID-19 pandemic. Asking people to remove their masks to participate in a nonessential study had safety implications. In addition, when telemedicine clinics began, it was difficult to have participants complete and return journals.

Finally, and notably, there were issues with the methods. The methods did not include validated scales for the symptoms, and there was no accounting for type and stage of the disease. There was also no accounting for the intensity and amount of cancer treatment or symptom management regimen. Finally, race, ethnicity, and gender differences to cancer treatment symptoms were not accounted for among participants.

KNOWLEDGE TRANSLATION

- Appetite, anxiety, fatigue, and nausea were well managed for participants with gastrointestinal, neuroendocrine, and skin cancers in this study.
- Oncology nurses may consider incorporating inhaled ginger essential oil in their practice for the symptoms of anxiety and fatigue after further validation research.
- Individuals who are reluctant to use pharmacologic therapies may have an additional option to consider for symptoms affecting quality of life.

Implications for Practice and Research

Developing and implementing research studies at the bedside or chairside is within oncology nurses' scope of practice. Instructing patients on the safety and efficacy of EOs is an important part of oncology nursing practice because patients continue to seek alternative therapies. EOs are becoming part of a holistic, nonpharmacologic approach to alleviate symptoms affecting QOL, and oncology nurses need to gain knowledge about EO safety and efficacy. Oncology nurses may find ginger EO helpful in managing symptoms of fatigue and anxiety in patients with gastrointestinal and skin cancers.

Future studies need to account for cancer stage, treatment cycle, and therapeutic and symptom management drug regimens. They must also prescreen for distressing or high levels of symptoms to ensure that the study group has no basement or ceiling effect. In addition, there are opportunities to examine

system clusters. Lee et al. (2017) reviewed the Theory of Unpleasant Symptoms and highlighted the importance of a nursing practice that, because of the synergistic effects of symptoms, focuses on multiple symptoms rather than individual symptoms.

A new study examining the effects of ginger EO compared to a control oil on anxiety and fatigue would be beneficial to confirm or refute the results of this study. Research opportunities within oncology nurses' scope may include immediate symptom relief, innovative inhalation delivery methods, safety and interaction profiles, and patients' personal aroma preference. Further operational studies could look at the cost of EOs compared to pharmacologic options.

Conclusion

Inhaled ginger EO had a significant effect on fatigue and anxiety in patients with gastrointestinal and skin cancers. The results of this study also indicated that there are patients with a low symptom burden, perhaps because standard-of-care symptom management treatments have the intended effect. This is encouraging for oncology nurses to note when providing patient education.

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