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The effectiveness of nurse-delivered aromatherapy in an acute care setting

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ABSTRACT

Objective: To examine the use and effectiveness of essential oil therapeutic interventions on pain, nausea, and anxiety, when provided by nurses to patients in acute hospital settings across a large health system. This study expands upon the limited body of literature on aromatherapy use among inpatients.
Design: Retrospective, effectiveness study using data obtained from electronic health records.
Setting: Ten Allina Health hospitals located in Minnesota and western Wisconsin.
Interventions: Nurse-delivered aromatherapy.
Main Outcome Measures: Change in patient-reported pain, anxiety, and nausea, rated before and after receiving aromatherapy using a numeric rating scale (0–10).
Results: There were 10,262 hospital admissions during the study time frame in which nurse-delivered aromatherapy was part of patient care. The majority of admissions receiving aromatherapy were females (81.71%) and white (87.32%). Over 75% of all aromatherapy sessions were administered via inhalation. Lavender had the highest absolute frequency (49.5%) of use regardless of mode of administration, followed by ginger (21.2%), sweet marjoram (12.3%), mandarin (9.4%), and combination oils (7.6%). Sweet marjoram resulted in the largest single oil average pain change at −3.31 units (95% CI: −4.28, −2.33), while lavender and sweet marjoram had equivalent average anxiety changes at −2.73 units, and ginger had the largest single oil average change in nausea at −2.02 units (95% CI: −2.55, −1.49).
Conclusions: Essential oils generally resulted in significant clinical improvements based on their intended use, although each oil also showed ancillary benefits for other symptoms. Future research should explore use of additional essential oils, modes of administration, and different patient populations.

1. Background

Nurses are often responsible for assessing, managing, and treating symptoms of pain, nausea, and anxiety among hospitalized patients. Symptom management is an integral part of medical care delivered in acute care hospitals. Tens of millions of individuals are hospitalized in the U.S. in any given year, and a vast majority of them experience pain, nausea, and/or anxiety.[1] Pain among hospitalized patients affects patients across the board and is not limited to specific populations; in other words, no patient groups within a hospitalized population are at low risk for pain.[2]

Since 2001, the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) pain management standards require hospitals to ask patients about their pain and provide appropriate care; since January 2015, the pain management standards emphasizes the role of non-pharmacologic strategies for managing pain, adjunctive to pharmacological care when appropriate.[3] Pain assessments and pain management are within the scope of nursing practice and are nursing priorities.[4] and nurses consider themselves advocates when it comes to managing pain[5] Furthermore, nurses have an important role to educate patients about their options for pain medication and/or non-pharmacological pain management options.[4]

Medication-induced, chemotherapy-induced, and post-operative nausea and vomiting (PONV) are common and

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Table 1
Essential oils, chemical components, indications for use and actions for Allina Health's nurse-delivered aromatherapy program.

Essential Oil	Chemical Components		Uses	Actions
	Family	Primary Component(s)		
Ginger *Zingiber officinale*	Sesquiterpenes	α-zingiberene,	nausea, stimulates appetite, indigestion/flatulence/constipation, pain	antiemetic, digestive stimulant, analgesic, anti-inflammatory
		β-sesquiphellandrene		
	Monoterpenes	camphene		
		d-limonene		
		β-myrcene		
	Aldehydes	geranial		
		neral		
Lavender *Lavandula angustifolia*	Esters	linalyl acetate	anxiety/stress, insomnia, pain: muscular/headache, migraines	sedative, analgesic, antispasmodic, antibacterial
	Monoterpenols	linalool		
Mandarin *Citrus reticulata*	Monoterpenes	d-limonene	anxiety/stress, digestion/nausea, restlessness, constipation, insomnia	Euphoric, aids/improves digestive function
		γ-terpinene		
		β-myrcene		
Sweet Marjoram *Origanum majorana*	Monoterpenes	γ-terpinene	pain: muscular/headache, muscle spasm, anxiety/stress, insomnia, constipation	analgesic, antispasmodic
		α-terpinene		
		terpinolene		
		β-myrcene		
	Monoterpenols	terpinen-4-ol		
		linalool		
		α-terpineol		
	Esters	sabinene hydrate		
		linalyl acetate		

uncomfortable symptoms experienced by hospital inpatients that can lead to adverse outcomes in their recovery.[6] It is estimated that 75 million people annually experience PONV alone.[6] Anxiety is prevalent in the inpatient hospital setting,[7] and has been shown to have negative outcomes in specific patient populations like heart attack patients and high risk obstetric patients.[8,9]

Pharmacologic therapies have long been used to prevent and/or treat pain, PONV, and anxiety, but many of them have unwanted costs (related to length of stay and drug costs) and side effects.[10] In particular, opioid dependence is a growing problem within the United States.[11] and opioid use can lead to tolerance and hyperalgesia[12] Many patients continue to suffer from poorly managed pain despite pharmacologic intervention.[13,14] In this context of the challenges of symptom management for hospitalized patients, the complementary use of aromatherapy may be a promising tool for nurses.

Clinical aromatherapy is the controlled and therapeutic use of essential oils in the clinical setting for specific, measurable outcomes and is a natural therapy increasingly being used to improve symptoms and maintain health and well-being during a hospital stay.[15] Research on aromatherapy use has mostly been limited by single oil choices and targeted to specific populations but is promising in its results to show that therapeutic-grade essential oils are efficacious at reducing pain, nausea, and anxiety in conjunction with standard care.[16–18]

Allina Health created an integrative health clinical service line in March 2012 and, within this service line, an operational framework for essential oil utilization and delivery was created for all nursing staff. The development of the aromatherapy program is described in detail elsewhere.[19] Nurses are encouraged to offer aromatherapy as part of a holistic nursing care plan, in which they consider the whole patient rather than attending only to symptoms. This health system-wide study will examine the use and effectiveness of essential oil therapeutic interventions on pain, nausea, and anxiety, when provided by nurses to a large number of patients in an acute hospital setting. This study expands upon the currently limited body of literature on aromatherapy use among inpatients.

2. Methods

2.1. Study design and setting

This retrospective, observational study of inpatients who received nurse-delivered aromatherapy was conducted at Allina Health, based in Minneapolis, MN. Allina Health is a not-for-profit family of hospitals, clinics, and other care services throughout Minnesota and western Wisconsin. The current study took place at 10 of Allina's 12 hospitals; two hospitals did not yet offer nurse-delivered aromatherapy during the study timeframe and were therefore not included in the study.

The Penny George Institute for Health and Healing (PGIHH) at Allina Health was founded in 2003 and offers hospitalized patients, through electronic physician and nurse referrals, a wide array of integrative health services at no charge to patients.[20,21] PGIHH was elevated to a clinical service line in 2012 and established the health system-wide nurse-delivered aromatherapy program in that year.[19] Allina Health, in collaboration with PGIHH, provides the opportunity for all employed nurses to receive online training in aromatherapy delivery. Successful completion of the training allows nurses the opportunity to use aromatherapy in their nursing practice at Allina Health.

2.2. Study population

The study population included all inpatients age 18 years or older seen at any of Allina Health's ten hospitals in which nurse-provided aromatherapy was available. Patients who received nurse-delivered aromatherapy between February 1, 2012 and June 30, 2014 were retrospectively identified through electronic health records (Epic; Verona, WI) to be included in the study population. Patients seen as outpatients, in the emergency room, and who were

Table 2
Characteristics of Allina Health inpatient admissions receiving nurse-delivered aromatherapy.

	Total Admissions* (N = 10,262)	Essential oil defined (N = 7183)	Essential oil undefined (N = 3079)	*p*-value**
Age				
Mean (SD)	55.42 (18.54)	55.43 (18.70)	55.38 (18.16)	0.746
Length of Stay				
Mean (SD)	6.66 (7.92)	6.55 (7.60)	6.91 (8.60)	0.008
Sex				
Female	7487 (73.0%)	5214 (72.6%)	2273 (73.8%)	0.197
Male	2775 (27.0%)	1969 (27.4%)	806 (26.2%)	
Marital Status				
Married/Life Partner/Significant Other	4689 (45.7%)	3315 (46.2%)	1374 (44.6%)	0.446
Divorced/Separated	1395 (13.6%)	952 (13.3%)	443 (14.4%)	
Widowed	1312 (12.8%)	912 (12.7%)	400 (13.0%)	
Single	2850 (27.8%)	1994 (27.8%)	856 (27.8%)	
Other/Unknown	16 (0.2%)	10 (0.1%)	6 (0.2%)	
Ethnicity				
Hispanic/Latino	194 (1.9%)	137 (1.9%)	57 (1.9%)	0.258
Not Hispanic/Not Latino	9990 (97.3%)	6998 (97.4%)	2992 (97.2%)	
Unknown	78 (0.8%)	48 (0.7%)	30 (1.0%)	
Race				
American Indian/Alaska Native/Native Hawaiian	145 (1.4%)	109 (1.5%)	36 (1.2%)	0.037
Asian	136 (1.3%)	98 (1.4%)	38 (1.2%)	
Black or African American	469 (4.6%)	310 (4.3%)	159 (5.2%)	
White	9417 (91.8%)	6609 (92.0%)	2808 (91.2%)	
Unknown	95 (0.9%)	57 (0.8%)	38 (1.2%)	
Health Insurance				
Commercial	4006 (39.0%)	2841 (39.6%)	1165 (37.8%)	0.247
Medicaid	2322 (22.6%)	1598 (22.2%)	724 (23.5%)	
Medicare	3608 (35.2%)	2524 (35.1%)	1084 (35.2%)	
Other	326 (3.2%)	220 (3.1%)	106 (3.4%)	
Illness Severity				
Minor	2679 (26.1%)	1952 (27.2%)	727 (23.6%)	<0.0001
Moderate	4380 (42.7%)	3138 (43.7%)	1242 (40.3%)	
Major	2369 (23.1%)	1580 (22.0%)	789 (25.6%)	
Extreme	758 (7.4%)	460 (6.4%)	298 (9.7%)	
Unknown	76 (0.7%)	53 (0.7%)	23 (0.7%)	
Hospital Location				
Urban	4393 (42.8%)	2955 (41.1%)	1438 (46.7%)	<0.0001
Rural	1309 (12.8%)	993 (13.8%)	316 (10.3%)	
Suburban	4560 (44.4%)	3235 (45.0%)	1325 (43.0%)	
Clinical Community				
Cardiovascular	323 (3.1%)	219 (3.0%)	104 (3.4%)	<0.0001
Mental Health	1859 (18.1%)	1360 (18.9%)	499 (16.2%)	
Neuroscience & Spine	365 (3.6%)	246 (3.4%)	119 (3.9%)	
Oncology	581 (5.7%)	411 (5.7%)	170 (5.5%)	
Orthopedic	669 (6.5%)	491 (6.8%)	178 (5.8%)	
Other Medical	5695 (55.5%)	3859 (53.7%)	1836 (59.6%)	
Unknown	770 (7.5%)	597 (8.3%)	173 (5.6%)	

* Total n refers to number of hospital admissions and not individual patients.
** *p*-Value calculated from two-tailed *t*-test and chi-square tests comparing essential oil defined and essential oil undefined groups.

in the hospital solely for observation were excluded. EHR data were obtained on all eligible inpatients and all patients whose medical record data were obtained gave written permission to Allina Health upon hospital admission to use their records for general research purposes.

The study was approved by the Schulman Associates Institutional Review Board. Because patients provided written permission to use their medical records for general research purposes, the IRB approved this specific study with a waiver of informed consent.

No patient side effects or complications from receiving aromatherapy were reported during the study. At Allina Health facilities, Patient Visitor Safety Reports (PVSR) are filled out online and submitted whenever there is patient or visitor harm, or in situations with safety concerns. During the timeframe of the study, only one PVSR was submitted related to nurse-delivered aromatherapy. A medical-surgical unit reported that a ginger aromatherapy inhaler (still wrapped in protective plastic) leaked fluid onto a countertop where it was stored. This was reported to the Certified Aromatherapists, the area was cleaned, and the inhaler was returned to the vendor without any harm.

2.3. Study outcomes

2.3.1. Demographic and admission characteristics

Data extracted from EHR included patient age at time of admission, hospital length of stay, marital status, sex, ethnicity, race, and health insurance status. Data also included the hospital and clinical community in which the patient was seen. The All Patient Refined Diagnostic Related Groups (APR-DRG) severity of illness measures calculated from patients' diagnoses codes were also extracted from medical records and include four categories: minor, moderate, major, and extreme.[22] Data pertaining to each nurse-delivered aromatherapy session, including: time of delivery, concurrent pharmaceutical and/or holistic interventions, essential oil, method of delivery, self-reported pre and post scores measuring patient pain, anxiety and nausea, were documented in a customized documentation flow sheet within the medical record.

2.3.2. Aromatherapy

Nurses used their clinical judgment to provide the aromatherapy they deemed necessary and therapeutic for each patient, after consulting with the patient. Indications for usage of aromatherapy,

Table 3
Frequency of essential oil use by mode of administration.

Mode of Administration	Ginger (N = 2196)	Lavender (N = 5132)	Mandarin (N = 975)	Sweet Marjoram (N = 1280)	Combination (N = 789)	Total Sessions (N = 10,372)
Inhaled	1933 (88.0%)	3776 (73.6%)	815 (83.6%)	888 (69.4%)	640 (81.1%)	8052 (77.6%)
Topical	227 (10.3%)	1194 (23.3%)	147 (15.1%)	359 (28.0%)	47 (6.0%)	1974 (19.0%)
Inhaled and Topical	36 (1.6%)	162 (3.2%)	13 (1.3%)	33 (2.6%)	102 (12.9%)	346 (3.3%)
All Sessions	2196 (21.2%)	5132 (49.5%)	975 (9.4%)	1280 (12.3%)	789 (7.6%)	10,372 (100%)

Table 4
Pre- to post-intervention mean change in pain, anxiety, and nausea scores and 95% confidence intervals, where pre > 0.[*]

	Pain (N = 2444) LSMean Δ (95% CI)[a]	Anxiety (N = 2305) LSMean Δ (95% CI)[a]	Nausea (N = 1404) LSMean Δ (95% CI)[a]
Ginger	**−2.70 (-3.69, −1.71)**	−1.81 (−2.99, −0.62)	**−2.02 (-2.55, −1.49)**
Lavender	**−3.22 (-4.19, −2.25)**	**−2.73 (-3.91, −1.55)**	−1.24 (−1.84, −0.65)
Mandarin	−2.88 (−3.88, −1.88)	**−2.44 (-3.64, −1.24)**	**−1.77 (-2.37, −1.17)**
Sweet Marjoram	**−3.31 (-4.28, −2.33)**	**−2.73 (-3.93, −1.53)**	−1.29 (−2.07, −0.51)
Combination	−3.43 (−4.43, −2.43)	−2.53 (−3.73, −1.33)	−2.02 (−2.59, −1.44)

All LS Mean Δ scores exhibited in the table are statistically different than 0.
[*] Bold text signifies essential oil is indicated for use for that outcome.
[a] Model adjusted for additional nurse-delivered CIH interventions, concurrent delivery of pain medications, and mode of aromatherapy administration.

per nurses' aromatherapy training, were wide-ranging. Examples include: patient requests for an alternative therapeutic option to medication and its side effects; break-through symptoms such as pain, anxiety, or nausea; and weaning off medications. The decision to accept or decline aromatherapy was up to the patient. When nurses were trained in providing aromatherapy, online instruction modules provided three scenarios to demonstrate nursing care settings where aromatherapy could be offered and how to introduce it to the patient.[19] On occasion, patients declined aromatherapy due to lack of interest, and a nurse's respect for that decision was considered to support the holistic model of patient empowerment. Declines were not recorded.

Essential oil options available to Allina Health nurses include ginger (*Zingiber officinale*), lavender (*Lavandula angustifolia*), mandarin (*Citrus reticulata*), and sweet marjoram (*Origanum majorana*) and are indicated for the treatment of a variety of conditions. Table 1 provides the characteristics of the four essential oils, as taught to Allina Health nurses, and includes the chemical components, symptom indications, and actions of each oil.

Some patients received aromatherapy more than one time throughout their hospital admission. The term 'session' is used to define each unique administration of aromatherapy, distinguished by time, within a hospital admission. Patients could receive more than one essential oil during each session, which we define as 'combination therapies.' The presence or absence of each of these essential oils was coded at each session such that ginger, lavender, mandarin, sweet marjoram, and any combination of these oils were mutually exclusive. Furthermore, essential oils could be provided through multiple modes of administration; mutually exclusive categories were created for delivery methods and these categories included inhaled, topical, or inhaled and topical.

As part of holistic nursing practice, nurses with further training can provide complementary and integrative health (CIH) services in addition to aromatherapy. Additional CIH services provided by Allina Health nurses include acupressure, energy work, Korean hand therapy, massage, and mind-body therapies (e.g. guided imagery, progressive relaxation). Nurses, as part of their regular scope of practice, also provide pain medication in addition to aromatherapy. To account for additional interventions that occurred simultaneously with aromatherapy delivery, binary indicators of CIH services and pain medications were created.

2.3.3. Pain, nausea, and anxiety scores

Nurses collected patients' self-reported pain, nausea, and anxiety scores directly prior to and within 60 min of the aromatherapy session. Nurses requested patients to provide a single number to indicate the level of pain they were currently experiencing on an 11-point numeric rating scale where 0 was defined as 'no pain' and 10 was defined as 'worst pain imaginable.' Similarly, nurses recorded anxiety and nausea scores using the same methodology, where 0 was 'no anxiety' and 'no nausea' and 10 was 'worst anxiety imaginable' and 'worst nausea imaginable.'

In some instances, nurses did not capture pre- and/or post-scores related to the administration of aromatherapy. In those instances, pain, nausea, and anxiety scores were taken from the EHR if they occurred within 60 min of one another and the time of the aromatherapy and there were no additional medications or integrative medicine interventions documented within that time period. Any remaining missing data were not imputed; sessions with missing data and pre scores of zero were excluded from the analysis. The primary endpoints were changes in pain, anxiety, and nausea scores, calculated by subtracting the pre-score from the post-score.

2.4. Analytic data set

Sample size for this retrospective study was determined by the documentation of nurse delivered aromatherapy in one of ten Allina hospitals or medical centers. No a priori power calculation was performed.

A total of 27,552 aromatherapy sessions were identified between February 1, 2012 and June 30, 2014. Of those sessions, 9116 were excluded from the analysis (9069 sessions that took place in the Maternity Care center where an expanded aromatherapy protocol is available; and 47 sessions that included bath salts, a mode of essential oil administration not typically available to non-Maternity Care patients). The analytic data set included 18,436 sessions from 10,262 admissions and 9389 unique patients.

To calculate frequency of essential oil use, we excluded 8064 aromatherapy sessions that were documented in the EHR but data regarding both essential oil type and mode of administration were not complete. The final analytic dataset for that analysis included 10,372 aromatherapy sessions from 7183 inpatient admissions and 6763 unique patients. To examine the change in each of the symptom scales, we excluded 2433 additional sessions where patients either reported zero pre score(s) and/or pre scores were missing for each of the outcomes of interest (pain, anxiety and nausea). This resulted in a remaining 7939 sessions from 6155 admissions and 5837 unique patients.

2.5. Statistical analysis

Mixed effects linear regression was used to estimate changes in pain, anxiety, and nausea resulting, where patients self-reported one or a combination of these symptoms, from aromatherapy provided by nursing staff. Least squared means and 95% confidence intervals (95% CIs) are presented and estimate the average effect of each individual essential oil while controlling for additional nurse-delivered CIH interventions, pain medications, and mode of aromatherapy administration. Correlation between sessions within an individual admission was accounted for by including a random effect for admission in the model. Least squared means (LSMeans) were calculated in order to estimate average effect of each individual essential oil while controlling for other holistic interventions, medications and mode of delivery. All analyses were carried out using SAS statistical software, version 9.4 (SAS Institute Inc.; Cary, NC).

3. Results

3.1. Descriptive statistics

There were 10,262 Allina Health hospital admissions during the study timeframe in which 18,436 nurse-delivered aromatherapy sessions were part of patient care (Table 2). The majority of admissions (65.3%) had only one aromatherapy session. The mean age of inpatients receiving nurse-delivered aromatherapy was 55.42 years. Females (73.0%) and individuals of self-reported white race (91.8%) and not Hispanic/Latino ethnicity (97.7%) accounted for the majority of admissions receiving aromatherapy. Suburban hospital locations delivered more aromatherapy (44.4%) than urban (42.8%) and rural (12.8%) locations.

Nurses did not always record within the EHR what oil(s) were administered and the mode of administration; therefore, patient admission characteristics were divided into 'essential oil defined' and 'essential oil undefined' groups (Table 2). These two groups differed with respect to length of stay (p-value = 0.008), race (p-value = 0.037), illness severity (p-value < 0.0001), hospital location (p-value < 0.0001), and clinical community (p-value < 0.0001).

3.2. Nurse-Delivered aromatherapy utilization

A total of 10,372 nurse-delivered aromatherapy sessions occurred in which nursing staff documented within the EHR the essential oil(s) and mode of administration (Table 3). The majority of aromatherapy sessions were administered through inhalation (77.6%); 19.0% were delivered topically and 3.3% were delivered both through inhalation and topical modes. The most frequently used essential oil was lavender, accounting for 49.5% of all essential oils used. Lavender had the highest absolute frequency of use regardless of mode of administration. The second most administered essential oil was ginger (21.2%), followed by sweet marjoram (12.3%), mandarin (9.4%), and combination oils (7.6%).

3.3. Anxiety, nausea, and pain analysis

Results from the mixed effects linear regression indicate that aromatherapy using sweet marjoram resulted in the largest single oil average pain change at −3.31 units (95% CI: −4.28, −2.33), while unspecified combinations of the four oils had an estimated pain change of −3.43 (95% CI: −4.43, −2.43). Within the model for average anxiety change, both lavender and sweet marjoram had an average change of −2.73 units (95% CI: −3.91, −1.55; −3.93, −1.53 respectively) and ginger, the only oil not indicated to address anxiety, had the lowest change, which was still significantly different from zero. The single oil reporting the largest average change in nausea was ginger at −2.02 units (95% CI: −2.55, −1.49). Mandarin, the only other oil indicated for use to treat nausea, resulted in an estimated average change of −1.77 units (95% CI −2.37, −1.17) (Table 4).

We employed methods used by Ostermann and colleagues.[23] to test that the changes we observed were not due to regression to the mean. We concluded that observed changes in each of the scales (pain, anxiety and/or nausea) were unlikely to be caused by regression to the mean (results not shown).

4. Discussion

In this effectiveness study of nurse-delivered aromatherapy, pain, anxiety, and nausea were all found to be reduced when patients were administered essential oils adjunctive to usual care. Aromatherapy sessions were most commonly administered through inhalation, and lavender was the most frequently used essential oil. Except in the case of mandarin for pain, where mandarin showed higher average pain reduction than ginger, an oil indicated for pain relief, single oils indicated for symptoms showed higher average changes than those not indicated. Each oil also showed some ancillary benefits for other symptoms.

Previous literature has examined the efficacy of essential oils for treating symptoms in small, controlled samples. Aromatherapy interventions used in pain management have shown promising results for postoperative pain.[24,25] In particular, one study supported using lavender aromatherapy as a nursing intervention for pain relief[26] However, research on pain relief associated with aromatherapy is limited to postoperative data and previously has not been reviewed in a hospital-wide setting. Randomized controlled trials have examined the effects of aromatherapy on PONV, with results showing aromatherapy as a promisingly inexpensive, noninvasive, and patient-controlled treatment for nausea.[27–29] Although research is limited on the effects of aromatherapy on anxiety and anxiety symptoms, one study in an intensive care unit setting found aromatherapy to be effective in significantly reducing anxiety.[30] In contrast to this previous research measuring efficacy, our study provides evidence for the effectiveness of nurse-delivered aromatherapy across a large clinical population and across diverse hospital settings.

Several factors limit our findings. Pain, anxiety, and nausea scores were self-reported (0–10 Likert scale) and collected by the nurses who administered the aromatherapy, but this method for collection of scores is standard and recommended in clinical practice.[31,32] This was not a randomized controlled trial, but the single arm observational design is appropriate for exploring the aromatherapy program in a real-world hospital setting.[33,34] Furthermore, our findings of symptom improvement are consistent with the results of smaller efficacy studies as noted above. Due to the absence of a control group in our study, the effect of regression to the mean could be a potential concern in attributing our results to aromatherapy. However, we tested to conclude that regression to the mean was not likely the cause of our findings.

Future research should include the use of additional essential oils, modes of administration, and different patient populations. For example, Allina Health offers maternity care patients the option to add essential oil(s) to bath salts; maternity patients and bath salts were not studied in the present analysis but are important components to the aromatherapy program that must be evaluated. Finally, the evidence base on nurse-delivered aromatherapy would benefit from other hospital systems with aromatherapy offerings conducting their own effectiveness evaluations, to further build an understanding of real-world outcomes and best practices.

The adjunctive use of essential oils for symptom management in the present study setting is one component of a holistic nurs-

ing approach employed in one health system. While results cannot be generalized to other programs that may have different patient demographics, or distinct essential oil protocols and workflows, the aromatherapy program at Allina Health may share similarities with other programs built on holistic nursing foundations. In holistic nursing, the nurse seeks to become a therapeutic partner with patients, and takes into account the whole patient.[35] Aromatherapy is delivered as a therapeutic modality within a broader healing environment. Our outcomes should be considered in the context of a multifaceted approach to healing, wherein many factors may influence the management and reduction of symptoms.

In conclusion, this study provided a unique opportunity to evaluate the effectiveness of nurse-delivered aromatherapy to hospitalized patients across a large health system. Our research suggests that patients who receive aromatherapy in conjunction to standard medical care report, on average, statistically significant decreases in pain, anxiety, and nausea. The results from this study also indicate that the four essential oils we investigated may help with symptom relief beyond their indication(s) of use. Future research should explore these ancillary effects, as well as include other patient populations and modes of administration.

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