

The Effectiveness of Nurse-Delivered Aromatherapy in an Acute Care Setting

Jill R. Johnson, PhD, MPH¹; Rachael L. Rivard, MPHc¹; Kristen H. Griffin, MA, MPH¹; Alison K. Kolste, BS¹; Denise Joswiak, BSN, RN, HNB-BC, CA²; Mary Ellen Kinney, RN, BA, HN-BC, CCAP²; Jeffery A. Dusek, PhD¹

¹Integrative Health Research Center, Penny George Institute for Health and Healing, Allina Health, Minneapolis, Minnesota; ²Allina Health, Penny George Institute for Health and Healing, Minneapolis, Minnesota

ABSTRACT

Purpose: Our purpose was to examine the use and effectiveness of essential oil therapeutic interventions on pain, nausea, and anxiety, when provided by nurses to patients in hospitals across a large health system, Allina Health. All Allina Health nurses have the opportunity to receive online training in aromatherapy delivery. Research on clinical aromatherapy has been limited in scope but is promising in demonstrating that therapeutic-grade essential oils are efficacious at reducing pain, nausea, and anxiety in conjunction with standard care. This study expands upon the existing literature on aromatherapy use among inpatients.

Methods: A retrospective effectiveness study of nurse-delivered aromatherapy was conducted across ten Allina Health hospitals, using data from electronic health records. Outcome measures were change in patient-reported pain, anxiety, and nausea, rated on a numeric rating scale (0-10) before and after receiving aromatherapy.

Results: During the study timeframe, there were 10,262 hospital admissions in which nurse-delivered aromatherapy was part of patient care. The majority of admissions receiving aromatherapy were female (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 indicated use, although each oil also showed ancillary benefits for other symptoms. Future research should explore use of additional essential oils, modes of administration, and patient populations. Nurse-delivered aromatherapy is a scalable concept with possible utility for hospitalized patients nationwide.

BACKGROUND

- Nurses play a central role in assessing, managing, and treating symptoms of pain, nausea, and anxiety among hospitalized patients.
- Pharmacologic therapies have long been used to prevent and/or treat pain, post-operative nausea and vomiting, and anxiety, but many of them have unwanted costs and side effects. Many patients continue to suffer from poorly managed pain.^{1,2}
- Clinical aromatherapy is the controlled and therapeutic use of essential oils in the clinical setting for specific, measurable outcomes.
- 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.³⁻⁵
- This health system-wide study examined 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.

METHODS

Study Design and Setting

- Retrospective, observational study of inpatients who received nurse-delivered aromatherapy at ten Allina Health hospitals.
- 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.
- PGIHH established the health system-wide nurse-delivered aromatherapy program in 2012.
- All employed nurses have the opportunity 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.

Study Population

- 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 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.

Study Outcomes

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.
- Data pertaining to each nurse-delivered aromatherapy session, including: time of delivery, concurrent pharmaceutical and/or holistic interventions, essential oil, mode of administration, self-reported pre- and post-scores measuring patient pain, anxiety and nausea, were documented in a customized documentation flowsheet within the medical record.

Aromatherapy

- Per nurses' aromatherapy training, indications for use of aromatherapy 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.
- 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.'
- No patient side effects or complications from receiving aromatherapy were reported during the study.

Pain, Nausea, and Anxiety Scores

- Nurses collected patients' self-reported pain, nausea, and anxiety scores on 0-10 scales directly prior to and within 60 minutes of the aromatherapy session.
- The primary endpoints were changes in pain, anxiety, and nausea scores, calculated by subtracting the pre-score from the post-score.

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.
- All analyses were carried out using SAS statistical software, version 9.4 (SAS Institute Inc.; Cary, NC).

RESULTS

- Descriptive statistics are displayed in **Table 2**. Essential oil "defined" or "undefined" refers to whether or not nurses documented the oil type and mode of administration, as opposed to simply whether or not aromatherapy was administered.
- During the study timeframe, there were 10,262 hospital admissions in which nurses delivered aromatherapy. 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.
- The final analytic data set (after excluding aromatherapy sessions with incomplete data) consisted of 7,939 sessions from 6,155 admissions and 5,837 unique patients.
- 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%).
- The anxiety, nausea, and pain analysis resulted in all statistically significant changes. **Table 3** shows these findings.

CONCLUSIONS

- This study provided a unique opportunity to evaluate the effectiveness of nurse-delivered aromatherapy to hospitalized patients across a large health system.
- Results suggests that patients who receive aromatherapy in conjunction with 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 primary indication(s) for use.
- Future research should explore these ancillary effects, as well as include other patient populations and modes of administration.

REFERENCES

- Mitchell M: Pain management in day-case surgery. *Nursing standard* (Royal College of Nursing (Great Britain) : 1987) 2004, 18(25):33-38.
- Yosselson-Superstine S, Gutman R, Magora F: The propriety of narcotic usage in hospitalized patients. *Journal of clinical and hospital pharmacy* 1986, 11(1):55-60.
- Tate S: Peppermint oil: a treatment for postoperative nausea. *Journal of advanced nursing* 1997, 26(3):543-549.
- Buckle J: Use of aromatherapy as a complementary treatment for chronic pain. *Altern Ther Health Med* 1999, 5(5):42-51.
- Conrad P, Adams C: The effects of clinical aromatherapy for anxiety and depression in the high risk postpartum woman – a pilot study. *Complement Ther Clin Pract*, 18(3):164-168.

FUNDING

This work was partially supported by the Penny George Institute Foundation., George Family Foundation, Penny and Bill George, Omar and Helen Ishrak, the Margaret and Angus Wurtele Fund of the Minneapolis Foundation, and Abbott Northwestern Hospital Foundation.

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 <i>Zingiber officinale</i>	Sesquiterpenes	α-zingiberene, β-sesquiphellandrene	nausea, stimulates appetite, indigestion/flatulence/constipation, pain	antiemetic, digestive stimulant, analgesic, anti-inflammatory
	Monoterpenes	camphene, d-limonene, β-myrcene		
	Aldehydes	geranial, neral		
Lavender <i>Lavandula angustifolia</i>	Esters	linalyl acetate	anxiety/stress, insomnia, pain: muscular/headache, migraines	sedative, analgesic, antispasmodic, antibacterial
	Monoterpenols	linalool		
Mandarin <i>Citrus reticulata</i>	Monoterpenes	d-limonene, γ-terpinene	anxiety/stress, digestion/nausea, restlessness, constipation, insomnia	Euphoric, aids/improves digestive function
		β-myrcene		
Sweet Marjoram <i>Origanum majorana</i>	Monoterpenes	γ-terpinene, α-terpinene, terpinolene, β-myrcene	pain: muscular/headache, muscle spasm, anxiety/stress, insomnia, constipation	analgesic, antispasmodic
	Monoterpenols	terpinen-4-ol, linalool		
		Esters		

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

	Total Admissions* (N=10,262)	Essential oil defined (N=7,183)	Essential oil undefined (N=3,079)	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	7,487 (73.0%)	5,214 (72.6%)	2,273 (73.8%)	0.197
Male	2,775 (27.0%)	1,969 (27.4%)	806 (26.2%)	
Marital Status				
Married/Life Partner/Significant Other	4,689 (45.7%)	3,315 (46.2%)	1,374 (44.6%)	0.446
Divorced/Separated	1,395 (13.6%)	952 (13.3%)	443 (14.4%)	
Widowed	1,312 (12.8%)	912 (12.7%)	400 (13.0%)	
Single	2,850 (27.8%)	1,994 (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	9,990 (97.3%)	6,998 (97.4%)	2,992 (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	9,417 (91.8%)	6,609 (92.0%)	2,808 (91.2%)	
Unknown	95 (0.9%)	57 (0.8%)	38 (1.2%)	
Health Insurance				
Commercial	4,006 (39.0%)	2,841 (39.6%)	1,165 (37.8%)	0.247
Medicaid	2,322 (22.6%)	1,598 (22.2%)	724 (23.5%)	
Medicare	3,608 (35.2%)	2,524 (35.1%)	1,084 (35.2%)	
Other	326 (3.2%)	220 (3.1%)	106 (3.4%)	
Illness Severity				
Minor	2,679 (26.1%)	1,952 (27.2%)	727 (23.6%)	<0.0001
Moderate	4,380 (42.7%)	3,138 (43.7%)	1,242 (40.3%)	
Major	2,369 (23.1%)	1,580 (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	4,393 (42.8%)	2,955 (41.1%)	1,438 (46.7%)	<0.0001
Rural	1,309 (12.8%)	993 (13.8%)	316 (10.3%)	
Suburban	4,560 (44.4%)	3,235 (45.0%)	1,325 (43.0%)	
Clinical Community				
Cardiovascular	323 (3.1%)	219 (3.0%)	104 (3.4%)	<0.0001
Mental Health	1,859 (18.1%)	1,360 (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	5,695 (55.5%)	3,859 (53.7%)	1,836 (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.

Table 3: Pre- to post-intervention mean change in pain, anxiety, and nausea scores and 95% confidence intervals, where pre>0*

	Pain N=2,444	Anxiety N=2,305	Nausea N=1,404
	LSMean Δ (95% CI) †	LSMean Δ (95% CI)†	LSMean Δ (95% CI) †
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)

*Bold text signifies essential oil is indicated for use for that outcome.

[†]Model adjusted for additional nurse-delivered CIH interventions, concurrent delivery of pain medications, and mode of aromatherapy administration.