

## Qualitative Research

# Complementary Intervention in Postoperative Care: Aromatherapy's Role in Decreasing Postoperative Nausea and Vomiting

Emily Marsh, MSN, RN, ONC   
Donna Millette, BSIE  
Alison Wolfe, BSN, RN  
Concord Hospital

jhn

Journal of Holistic Nursing  
American Holistic Nurses Association  
Volume XX Number X  
XXXX 202X 1–8  
© The Author(s) 2021  
Article reuse guidelines:  
sagepub.com/journals-permissions  
10.1177/08980101211065555  
journals.sagepub.com/home/jhn



**Purpose:** This study analyzed the efficacy of Post-Ease, a custom essential oil aromatherapy blend, in decreasing postoperative nausea and vomiting (PONV) and the need for antiemetic drugs in an orthopaedic surgical population. **Study Design:** This is retrospective cohort study, utilizing electronic health record data pre- and post-implementation of a nurse-driven quality improvement intervention. **Methods:** The study examined the impact of an inhaled custom blend of essential oils containing lavender, peppermint, ginger and lemon to assist in decreasing PONV and reduce the use of antiemetic medications. Data on the use of antiemetic drugs in pre- and post-intervention periods were analyzed. **Findings:** Nurses provided the Post-Ease blend 384 times in 2020 to patients as an option before proceeding, if necessary, to antiemetic drugs. The intervention group demonstrated a statistically significant reduction in the number of unique surgical patients' need for antiemetics as treatment (22%;  $p = .05$ ). Similarly, the total doses of antiemetics administered was significantly reduced (21%;  $p \leq .05$ ) during the study period. **Conclusion:** This study supports the use of aromatherapy to reduce PONV and minimize antiemetic use in an orthopaedic population.

**Keywords:** *postoperative; nausea; vomiting; PONV; aromatherapy; essential oils; antiemetic; complementary therapies*

Postoperative nausea and vomiting (PONV) is a term that encompasses any feelings of nausea, vomiting, or queasiness following a surgical procedure. PONV can be distressing to patients and can lead to other complications in the care pathway (Wilson & Knaggs, 2018). For many, the unpleasant sensation of nausea and vomiting alone is considered a negative side effect of their surgery, but there are many other complications that can arise from PONV, and from the antiemetic medications often used to treat it (Ford & Park, 2020). The purpose of this study was to assess the effectiveness of Post-Ease, a custom blend of essential oils, as a complementary treatment in decreasing the incidence of PONV and the need for antiemetic drugs in an orthopaedic surgical population (Table 1).

## Background

PONV is a common occurrence after surgical procedures. Most commonly, these feelings stem from the body's natural, protective response to prevent the absorption of toxins, in reaction to surgical stimuli including anesthesia and opioids (Wilson & Knaggs, 2018). In fact, roughly 30% of individuals who undergo general anesthesia for a surgical procedure report feelings of PONV, with nearly 50%

---

**Authors' Note:** Acknowledgement for editing assistance: Maureen Dunn, MLIS. Please address correspondence to Emily Marsh, MSN, RN, ONC, Concord Hospital, 250 Pleasant Street, Concord, NH 03301, USA. e-mail: emarsh@crhc.org

reporting feelings of just nausea (Wilson & Knaggs, 2018). Another study reports that PONV may occur in 25–30% of all surgical cases, and in upwards of 80% of cases involving high risk patients (Sansonnens et al., 2016). Factors that can increase a patient's risk for developing PONV include a history of smoking, motion sickness, or previous PONV, and female sex (Abril, 2019). Patients who require general anesthesia are also at a higher risk of developing PONV (Sansonnens et al., 2016). Some evidence also points to psychological and emotional factors, such as pre-existing anxiety, as a risk factor for PONV (Laufenberg-Feldmann et al., 2019).

Due to the negative impact that PONV has on patients' well-being, there is an increased risk of delayed recovery and longer length of stay in the hospital (Wilson & Knaggs, 2018). A longer stay and a slower recovery can lead to higher levels of postoperative pain, decreased mobility and function, an increased risk for infection, and a higher financial burden (Ford & Park, 2020). Countless other physical, psychological and emotional side effects can also arise when one is plagued by PONV (Ford & Park, 2020).

Treating PONV with antiemetic medications, such as ondansetron or promethazine, is a common practice, and is the primary focus of the multimodal treatment recommended in current guidelines (Gan et al., 2020). Antiemetic medications themselves, however, may cause unwanted side effects such as constipation, QTc prolongation, delirium, and other complications. Using combinations of smaller amounts of these medications may help to reduce side effects, but also introduce complexity and cost, since a multimodal approach requires more drugs to be maintained on formulary, as well as customized patient risk and drug analysis (Gan et al., 2020). Using aromatherapy as a complementary treatment may assist in decreasing PONV, thereby reducing or eliminating the need for antiemetic drugs.

Aromatherapy is the practice of inhaling or directly applying essential oils to the skin to achieve physical, psychological, and spiritual well-being and has been used for a variety of reasons since ancient times (Mojay, 1999). Clinical aromatherapy, using essential oils to achieve a specific and measurable therapeutic outcome, is increasingly being used during hospital stays to address common patient concerns, including pain, nausea, and anxiety (Johnson et al., 2016). Aromatherapy is a cost-effective

therapy for treating PONV and is the fastest growing type of complementary therapy among the nursing community in the United States (Williams, 2020). The use of specific essential oils to reduce PONV is not only meant to decrease the negative sensations of nausea and vomiting, but also to reduce the need for antiemetic medications and its associated risks and side effects. It also allows the patient to maintain a greater degree of autonomy over their care, as they can easily stop the use of aromatherapy at any time.

## Protection of Human Subjects

Approval was obtained from the Institutional Review Board (IRB) at the study facility prior to beginning data collection. Although protected health information was referenced to ensure unique patient implications, no specific identifiers, such as name or date of birth, were used for this study.

## Methods

### Study Design and Setting

This retrospective cohort study was conducted at a not-for-profit regional medical center in central New Hampshire. Secondary analysis of electronic health record data was planned and conducted as part of a nurse-led quality improvement initiative to decrease the use of antiemetic medications with the use of Post-Ease, an inhaled aromatherapy blend. The data included a two-year patient record review to determine if there was any statistical difference in antiemetic use when comparing patients from one year prior to and one year during the Post-Ease intervention. The control group consisted of total hip and total knee arthroplasty patients in 2019 during which Post-Ease was not available as an intervention. The intervention group included total hip and total knee arthroplasty patients in 2020 that were offered the Post-Ease intervention. The control group was compared to the intervention group to determine if the amount of antiemetics administered had decreased with the offering of Post-Ease.

### Study Population

The approach of including only specific procedures, the use of standardized antiemetic order sets,

and a specific essential oil recipe allowed for relative comparison of patients from 2019 (pre-intervention) and from 2020 (post-intervention). Due to COVID-19 causing extreme variation in operational volumes March-April 2020, only May-December data for each year was compared for this study in order to maintain volume and case comparison consistency. The study population included total hip replacement and total knee replacement postoperative patients ready for (post anesthesia care unit (PACU) discharge or post-discharge from the PACU, on the orthopaedic unit.

The control group were orthopaedic postoperative cases occurring in 2019, when PONV was typically treated with a standardized order set for as-needed use of intravenous (IV) or oral (PO) form of ondansetron, prochlorperazine, or promethazine for nausea and vomiting. The intervention group consisted of orthopaedic postoperative cases beginning in 2020, when patients were offered the Post-Ease aromatherapy blend to decrease their PONV prior to

being offered antiemetic medications. Total number of total hip and knee replacement cases prior to intervention was 810 (56% female) with average age of 67.8 comparable to post-intervention cases at 886 (56% female) with average age of 67.9.

## Study Procedures

The study implemented the use of a custom made proprietary blend of essential oils, named Post-Ease, developed at the study site. Post-Ease is a blend of Lunaroma© oils containing lavender (*lavandula angustifolia*), peppermint (*menthe piperita*), ginger (*zingiber officinale*), and lemon (*citrus limomum*), to assist in decreasing PONV and antiemetic use. Specifically, peppermint and ginger have been used to help relieve nausea and vomiting, while lavender provides a calming effect; citrus enhances other oils and can be energizing (Williams, 2020). The delivery method consists of four measured drops of the Post-Ease essential oil blend onto a cotton round that is stored in an amber, light blocking, airtight container to preserve freshness, and made available for patient use on-demand. Decorative adhesive labels are provided by the healthcare facility, as well as the cotton round carrier pads. For use, the cotton round (called a “patch” at the study site) is attached to the postoperative patient’s hospital gown on their upper chest and held in place with a simple adhesive label. This patch enables the patient to inhale the scent safely; since the patch never touches the patient’s skin directly, concerns about allergic reactions are minimized (Sindle & Martin, 2021).

In order to provide the intervention to the patients, all nursing staff on the orthopaedic unit were required to complete training prior to administering the blend. In-service training regarding the application and administration of Post-Ease was developed and subsequently deployed to nursing staff within the orthopaedic unit. The training presentation defined and discussed aromatherapy and essential oils, benefits, and contraindications, and provided overview of PONV. The length of effectiveness of the Post-Ease patch is variable, and nursing judgement was used in order to determine when the pad needed to be changed, or if the patient reported it no longer had a scent or requested to have the patch removed.

Indications for the patch included nausea, vomiting, complaints of queasiness or sour stomach, and/or anxiety; contraindications included known allergies

**Table 1.** Antiemetic Comparative Data Summary for Hip and Knee Study Population.

	2019 May-Dec	2020 May-Dec
Total Included Hip and Knee surgical case volume	810	886
Gender totals; average Age	(F) 452; 67.3 (M) 358; 70.2	(F) 499; 68.3 (M) 386; 66.4 (Unk) 1; 68
a. Patients (Unique Encounter ID) Given Antiemetic in Total Included Case Volume		
Total post-PACU unique patients given antiemetics	161	125
Gender totals; average Age	(F) 130; 67.3 (M) 31; 70.2	(F) 96; 68.3 (M) 29; 66.4
Percent of total included case volume given antiemetic, Mean and SD	0.21 ± 0.06	0.06 ± 0.11
b. Doses of Antiemetic Given (Medication Events) in Total Included Case Volume		
Total post-PACU antiemetic administration events	234	186
Gender totals	(F) 196 (M) 38	(F) 142 (M) 44
Percent Dosing per total included case volume, Mean and SD	0.30 ± 0.11	0.21 ± 0.09

to any of the essential oils in the blend, acute respiratory distress, patient refusal, patient unable to tolerate the aroma, or if the patient was unable to follow instruction or education regarding use. In addition to the in-service training, the facility developed a work instruction regarding the step-by-step process for delivering Post-Ease, including pictures demonstrating the steps for application. Information regarding what to document in the electronic medical record, such as date and time of patch application/removal, and replacement (if applicable) was also included. Additionally, nursing staff were required to read and attest to a policy outlining its use.

During the intervention period, all hip and knee replacement patients cleared for discharge from the PACU and/or discharged to the orthopaedic unit from the PACU, were assessed for PONV as part of standard postoperative care. Any patients with symptoms of PONV were offered the Post-Ease blend as an alternative option to the standard order set protocol of antiemetic medications. Ongoing postoperative assessment ascertained whether the patient's symptoms resolved or not; if not, they were offered the standard antiemetic protocol.

## Data Analysis

Data from multiple sources were required to explore if there was any difference between antiemetic dosing for patients who were not offered the Post-Ease therapy intervention in 2019 versus antiemetic dosing for those who were offered the intervention in 2020.

1. Perioperative case record reports were filtered for the specific hip and knee procedures performed in the given time periods;
2. Pharmacy medication reports provided administration details based on standard order sets, dosing at the case level and cost for each medication administration type (IV or PO);
3. Time studies were conducted on activities related to Pharmacy and Nursing tasks for the specific antiemetic type and for the Post-Ease formulation with subsequent bulk assembly. This information was used to calculate material and labor hours involved in the administration of an antiemetic medication or a Post-Ease patch;

4. Encounter-level antiemetic administration events were then matched to information gathered in steps 1–3 above. Included records were those cases given antiemetics post discharge-ready from PACU;
5. Dosing trends (May-Dec 2019 and May-Dec 2020) were analyzed to yield: a) % of total doses given (volume of antiemetic administration) per case representing the rate at which antiemetics were administered for eligible cases; and b) % of (unique) patients accepting one or more dose/type of antiemetic which measured the use rate of antiemetic per patient. Only those patients who were administered antiemetic(s) were included in the analyses. Patients who only used Post-Ease were not included as they were considered the same as non-antiemetic patients thus, were excluded from calculations.
6. Statistical significance of antiemetic medication events was explored for the before/after groupings. Post analyses included retrospective cost analysis with implications for further financial savings through appropriate program expansion.

## Findings

During the study periods (May-December, 2019 and 2020), total case volume effectively increased by 9% whereas the average antiemetic doses given post PACU per surgical case decreased by 21%. Similarly, the average number of patients (unique encounter) who were given (any) antiemetic post PACU, decreased by 22%. Figure 1 shows the total doses of antiemetics given and the included case volume per month over the paired, 8-month periods. As mentioned in the Data Analysis section above, only patients given antiemetic(s) were included.

The null hypothesis  $H_0$  was examined to investigate if there was no statistical difference from before to after the Post-Ease intervention. The null hypothesis was rejected and the intervention demonstrated a statistically significant reduction in the number of unique surgical patients' need for antiemetic as treatment (22%;  $p = .05$ ). Similarly, the total doses of antiemetic administered was reduced (21%;  $p \leq .05$ ) during the study period.

To understand how "practically" significant or "how large" the effect, Cohen's  $d$  statistic was

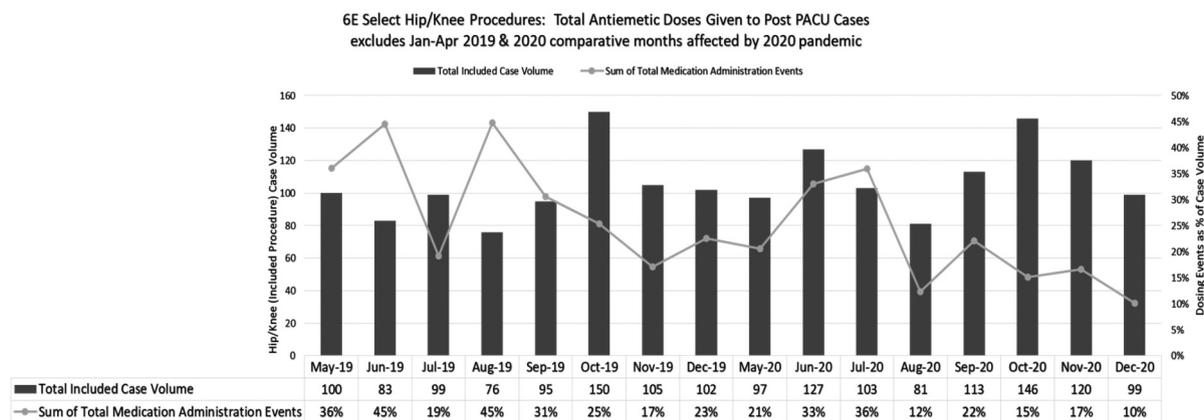


Figure 1. Total dosing trend per eligible surgical case over 16 month period.

paired with the aforementioned sample t-Test performed to learn the analysis of means for the alternative hypothesis. Cohen references “rules of thumb” to analyze the effect size measure (Cohen, 1988) as follows: 0.2 is considered small effect, 0.5 medium and 0.8 large. In these results, with antiemetic doses given ( $d=0.98$ ) and again, with number of patients given antiemetic medication ( $d=1.26$ ) Cohen’s  $d$  implies “large effect.” Thus, before and after intervention groups are interpreted as measurably different within population by approximately one or more standard deviation.

Figure 2(a) represents comparison of volume of antiemetic given monthly before and after intervention; and similarly, Figure 2(b) compares the total unique patients for included hip and knee replacement procedures referenced as eligible cases before and after the Post-Ease intervention.

Planned data preparation allowed focused examination on two discrete analyses: a) total doses given, depicting trends in antiemetic administration events; and b) total patient volume that were administered one or more doses of antiemetic, allowing for comparison of before/after Post-Ease acceptance by a patient. These separate analyses illustrate the use of aromatherapy to reduce PONV, with implications for minimizing antiemetic use and associated pharmacological costs. At this study site, the material and labor cost to administer the Post-Ease intervention totaled (at least) 2 times less than oral and 3 times less than IV antiemetics. Because less than 15% of all surgical procedures at the study site were chosen to be included in this study, cost savings for the medical center were minimal; however, if the Post-Ease program can expand to even 60% of total

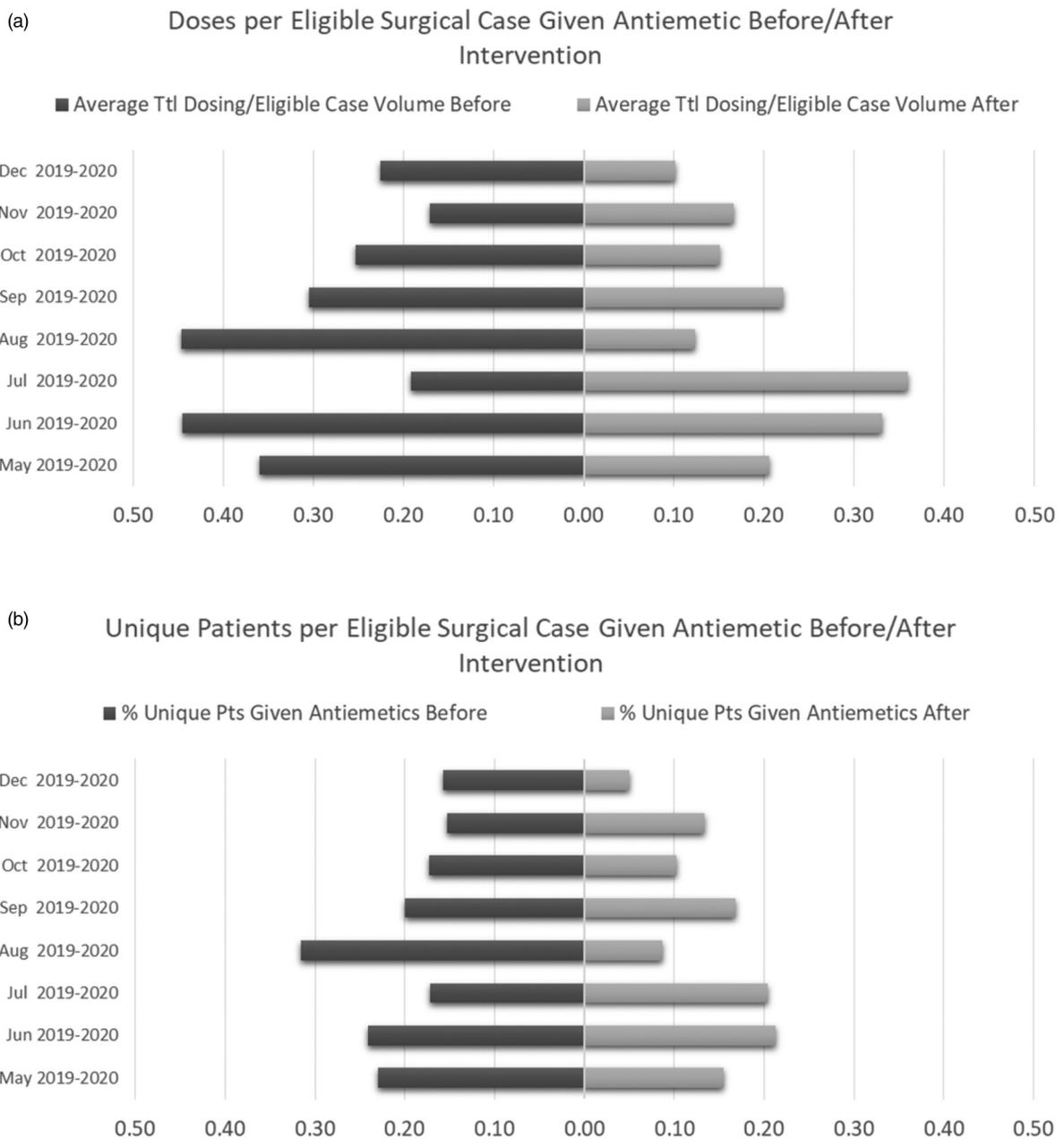
surgical volume, the site could realize up to 40% reduction in antiemetic medication and respective administration costs. This cost savings projection was extrapolated from the decreased administration of antiemetic medications from pre to post Post-Ease intervention.

## Discussion

### Implications of Findings

In this retrospective cohort study, the research question posed was whether the use of a custom aromatherapy blend could reduce PONV and the use of antiemetic medication. The null hypothesis for that question was rejected and statistical difference was demonstrated between the before and after Post-Ease intervention groups, indicating a 22% decrease in unique orthopaedic patients’ need for antiemetic medication by 22%. Similarly, the total doses of antiemetic administered for this group were reduced by 21% during the study period. Previous literature has demonstrated the effectiveness of aromatherapy for treating PONV (Abril, 2019; Hodge et al., 2014; Wilson & Knaggs, 2018). This study adds to the research base supporting the use of aromatherapy for PONV in an orthopaedic surgical setting, and further demonstrates a reduction in the use of antiemetic medications, with their associated costs and potential side effects.

Post-Ease has become an accepted complementary intervention for postoperative patients on the orthopaedic unit at the study site. Anticipated next steps include rolling the education and intervention out to other surgical units and also to inpatients



**Figure 2.** (a) Comparison of antiemetic doses before and after intervention for eligible cases\*. (b). Comparison of unique patients administered antiemetics before and after intervention for eligible cases\*.

undergoing chemotherapy. After implementation in these other clinical areas, the data can be reviewed and analyzed to see if there is an overall reduction in antiemetic use throughout the organization.

**Limitations**

Patient demographic diversity and predisposition variables were limited to the patient population in central New Hampshire. The sample of patients

was random and risk of PONV was not factored into the selection; nor were patient history of PONV, types/effects of anesthesia, comorbidities, or demographics. Further studies of aromatherapy’s role in PONV could include a wider range of demographics and types of operative procedures to determine additional benefits for more populations.

Due to limitations in the documentation of Post-Ease administration, data analysis could not distinguish between patients that only received

Post-Ease and patients who received no antiemetic intervention. Future studies could better identify subgroups that clearly reflect actual usage of Post-Ease and the possibility of eliminating any need for antiemetic medications.

## Conclusion

The custom aromatherapy blend, Post-Ease, is a safe, cost-effective, complementary treatment for PONV. Continued expansion of the Post-Ease program to all appropriate patients beyond the surgical realm could yield substantial yearly savings, reduce patient side-effects and promote non-pharmaceutical intervention.

## Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Funding

The author(s) received no financial support for the research, authorship and/or publication of this article.

## ORCID iD

Emily Marsh  <https://orcid.org/0000-0001-7768-7152>

## References

- Abril, K. (2019). Inhaled peppermint aromatherapy for treatment of postoperative nausea and vomiting: A complement to traditional pharmacologic treatments. *MEDSURG Nursing*, 28(6), 375-380. <https://doi.org/10.1016/j.jopan.2019.05.101>.
- Cohen, J. (1988). *The effect size. Statistical power analysis for the behavioral sciences* (pp. 77-83). Routledge.
- Ford, C., & Park, L. J. (2020). Assessing and managing nausea and vomiting in adults. *British Journal of Nursing*, 29(11), 602-605. <https://doi.org/10.12968/bjon.2020.29.11.602>
- Gan, T. J., Belani, K. G., Bergese, S., Chung, F., Diemunsch, P., Habib, A. S., Jin, Z., Kovac, A. L., Meyer, T. A., Urman, R. D., Apfel, C. C., Ayad, S., Beagley, L., Candiotti, K., Englesakis, M., Hedrick, T. L., Kranke, P., Lee, S., & Lipman, D., ... & B. K. Philip (2020). Fourth consensus guidelines for the management of postoperative nausea

- and vomiting. *Anesthesia & Analgesia*, 131(2), 411-448. <https://doi.org/10.1213/ANE.0000000000004833>
- Hodge, N. S., McCarthy, M. S., & Pierce, R. M. (2014). A prospective randomized study of the effectiveness of aromatherapy for relief of postoperative nausea and vomiting. *Journal of PeriAnesthesia Nursing*, 29(1), 5-11. <https://doi.org/10.1016/j.jopan.2012.12.004>
- Johnson, J. R., Rivard, R. L., Griffin, K. H., Kolste, A. K., Joswiak, D., Kinney, M. E., & Dusek, J. A. (2016). The effectiveness of nurse-delivered aromatherapy in an acute care setting. *Complementary Therapies in Medicine*, 25, 164-169. <https://doi.org/10.1016/j.ctim.2016.03.006>
- Laufenberg-Feldmann, R., Müller, M., Ferner, M., Engelhard, K., & Kappis, B. (2019). Is 'anxiety sensitivity' predictive of postoperative nausea and vomiting?: A prospective observational study. *European Journal of Anaesthesiology*, 36(5), 369-374. <https://doi.org/10.1097/EJA.0000000000000979>
- Mojay, G. (1999). *Aromatherapy for healing the spirit: Restoring emotional and mental balance with essential oils*. Healing Arts Press.
- Sansonnens, J., Taffé, P., & Burnand, B. (2016). Higher occurrence of nausea and vomiting after total hip arthroplasty using general versus spinal anesthesia: An observational study. *BMC anesthesiology*, 16(1), 44. <https://doi.org/10.1186/s12871-016-0207-0>
- Sindle, A., & Martin, K. (2021). Art of prevention: Essential oils - natural products not necessarily safe. *International Journal of Women's Dermatology*, 7(3), 304-308. <https://doi.org/10.1016/j.ijwd.2020.10.013>
- Wilson, L., & Knaggs, R. (2018). Postoperative nausea and vomiting in adults: The evidence base supporting pharmacological and non-pharmacological interventions for nausea and vomiting after surgery. *Clinical Pharmacist*, 10(11), 337-341. <https://doi.org/10.1211/PJ.2018.20205652>
- Williams, L. (2020). Is aromatherapy a critical care intervention? *AACN Advanced Critical Care*, 31(2), 198-202. <https://doi.org/10.4037/aacnacc2020931>

## Author Biographies

**Emily Marsh, MSN, RN, ONC**, is a nurse educator, adjunct nursing professor, published author, and clinician with over 14 years working in the nursing profession. Emily completed her Associate of Science in Nursing (ADN) from New Hampshire Technical Institute in 2007, where she has also been an adjunct professor since 2014. She has been in the role of Orthopaedic Nurse Educator at Concord Hospital since 2011. She earned her Master of Science in Nursing (MSN) from Walden University in 2012. She obtained her Orthopaedic Nurse Certification (ONC) from the Orthopaedic Nurse Certification Board (ONCB) in 2012. Emily is currently the co-chair of the Holistic Healing Council at Concord Hospital, where she works on various projects to incorporate holistic, complementary, and integrative medicine interventions into the care of both patients and staff.

**Donna Millette** brought her background in multiple manufacturing organizations as an Industrial/Manufacturing Engineer to healthcare in 2007, as a Performance Improvement Project Manager at Lahey Health in Burlington, MA. She joined Concord Hospital as Director of Lean Operations in 2011, partnering with clinicians to develop Lean leaders and A3 Thinking with a true zeal for patient care value stream improvement. Donna was honored to accept the role of Director of Process Analytics in 2016 with goals toward building data acumen and dependency on data-driven solutions across the enterprise. She provides technical consultation for data collection/use, key measure development, and means (data models) for users to interact with their own data. Donna is founding member of the New Hampshire Lean Network (NHLN),

where she also shares her career passion in creating armies of problem solvers.

**Alison Wolfe, RN, BSN** is an actively practicing registered nurse with over two years of experience in orthopaedics. Alison completed her Associate of Science in Nursing (ADN) from New Hampshire Technical Institute and went on to complete her Bachelor of Science in Nursing (BSN) from Granite State College. Her capstone for her BSN focused on the use of aromatherapy in the post-operative setting, and included research regarding the importance of including holistic care in healthcare. She is a member of the Concord Hospital's Holistic Healing Council. Incorporating holistic care and alternative complementary therapy methods has quickly become something she is passionate about.