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Change Agent Impact on Pain Management Experience through Lavender Aromatherapy: Evidence-Based Practice Project

Karen Mack MS, MBA, APRN, RN-BC, CCNS, ACNPC
George Washington University

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DOCTOR OF NURSING PRACTICE (DNP) PROGRAM

A DNP PROJECT

TITLE: Change Agent Impact on Pain Management Experience through Lavender Aromatherapy: Evidence-Based Practice Project

STUDENT NAME: Karen Mack, MS, MBA, APRN, RN-BC, CCNS, ACNPC

DNP PROGRAM PRIMARY ADVISOR
& DNP TEAM MEMBER:
DNP Project Primary Advisor: Mercedes Echevarria, DNP, APN
DNP Project Second Advisor: Kate Driscoll Malliarakis, PhD, ANP-BC, MAC, FAAN

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The George Washington University

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Abstract

Inadequately controlled acute pain is a problem for hospitalized patients. Non-pharmacological pain management interventions (NPPMIs) are recommended but underutilized. Nurse-directed lavender aromatherapy is a feasible and effective NPPMI. Patients at a community hospital, including its surgical-orthopedic unit, reported lower patient pain management experience scores than the average score of Magnet Recognition status hospitals. The community hospital planned to improve pain management by implementing nurse-directed lavender aromatherapy. The purpose of this evidence-based practice project was to fortify the hospital's nurse-directed lavender aromatherapy implementation with change agents. A logic model guided implementation. Project aims were to increase the surgical-orthopedic unit's pain management experience scores and to offer nurse-directed lavender aromatherapy to all appropriate patients by close of the project. Change agents included a Doctor of Nursing Practice student and nurse pain champions. Interventions included Doctor of Nursing Practice student-led: (a) surgical-orthopedic unit Lunch & Learn presentations and Rounding for Results sessions and (b) implementation discussions with nurse pain champions from four units, including the surgical-orthopedic unit. Because of these interventions, surgical-orthopedic unit patient pain experience scores increased from 43rd percentile to 78th percentile. In five of six project weeks, all appropriate surgical-orthopedic unit patients were offered nurse-directed lavender aromatherapy. Adoption of the practice change was successful, but slower than anticipated because of slow adoption by the nurses. Nurse leaders responded to this slow adoption by adding additional change agent rounds. Logic model development and change agents are effective strategies for NPPMI implementation.

Change Agent Impact on Pain Management Experience through Lavender Aromatherapy: Evidence-Based Practice Project

Introduction

Patients experiencing acute pain, particularly post-operative pain, often report it is inadequately controlled (Chou et al., 2016). Provision of non-pharmacological pain management interventions (NPPMIs) is a recommendation in evidence-based clinical practice guidelines (CPGs) (Chou et al., 2016; Mack et al., 2014; Registered Nurses' Association of Ontario [RNAO], 2013). A recent Joint Commission notice advised that NPPMIs are a critical element for effective pain management (Joint Commission, 2018). Aromatherapy with direct lavender inhalation has been associated with patient report of decrease in pain intensity in patients with acute and chronic pain, particularly post-operative pain (Bagheri-Nesami, Espahbodi, Nikkhah, Shorofi, & Charati, 2014; Heidari Gorji et al., 2015; Irmak Sapmaz et al., 2015; Johnson et al., 2016; Karaman et al., 2016; Kim et al., 2007; Lakhan, Sheafer, & Tepper, 2016).

Clinical aromatherapy is the topical application or inhalation of an essential oil to assist patients in managing symptoms such as pain, nausea, or anxiety (Buckle, 2015). Aromatic oils were used in ancient China, Egypt, India, and Greece, where the physician Hippocrates advocated aromatic baths and massages (Alliance of International Aromatherapists, n.d.). The term aromatherapy was created in 1937 by a chemist in France, René-Maurice Gattefossé (Buckle, 2015). In that same time-period, nurse and biochemist Marguerite Maury provided community education about the use aromatherapy to enhance wellness (Buckle, 2015).

Interventions such as aromatherapy require implementation science approaches, such as the Iowa model of evidence-based practice (EBP), to optimize adoption and sustainment (Cullen & Adams, 2012). Change agents are identified as an implementation strategy in the Iowa model

including unit-based champions, local opinion leaders, and external experts (Cullen et al., 2018). The purpose of this EBP project was to employ internal and external change agents to fortify implementation of lavender aromatherapy to improve patient pain management experience in a community hospital. The change agents for this project included a Doctor of Nursing Practice (DNP) student and four unit-based nurse pain champions (PCs).

Background and Significance

Needs Assessment

The 216-bed community hospital for this study resided in a 10-hospital system in the Mid-Atlantic United States. This community hospital resides in a suburban region near a major East Coast city and became a member of the health system in December 2012 ("Hospital merger," 2012).

Pain management for patients has been a focus for this health system since fiscal year (FY) 2014, when it endorsed the Assessment and Management of Acute Pain in the Hospitalized Adult Nursing CPG (2014) as the standard of practice (Mack et al., 2014). This CPG was adapted from a guideline developed by the Registered Nurses Association of Ontario (2013) in consultation with a nationally known nurse pain expert. The recommendations pertinent to NPPMIs are:

- "Psychological (psychosocial) interventions such as cognitive behavior therapy, music, distraction, relaxation techniques, and education should be considered in pain management because these interventions affect the way a person thinks, feels, and responds to pain" (Mack et al., 2014, p. 10).
- "Physical interventions such as physiotherapy and exercise, massage, positioning, and application of heat or cold should be considered along with pharmacological

interventions to reduce pain, improve sleep, mood and general wellbeing. When using more specialized interventions (TENS, acupuncture) consult the appropriate interprofessional team" (Mack et al., 2014, p. 10).

- "Evaluate any non-pharmacological (physical and psychological) interventions for effectiveness and the potential for interactions with pharmacological interventions (Ib)" (Mack et al., 2014, p. 10).
- "Reassess the person's response to the pain management interventions consistently using the same re-evaluation tool…The intensity of monitoring (frequency and duration) depends on a person's risk profile for opioid-induced sedation and respiration depression and the onset and duration of action or potential adverse effects of the pharmacologic and non-pharmacologic interventions" (Mack et al., 2014, p. 10-11).

In FY 2016, key pain management stakeholders from the health system endorsed the recommendations in the American Pain Society postoperative pain management CPG (Chou et al., 2016). The authors recommended NPPMIs such as transcutaneous electrical nerve stimulation (TENs) and cognitive-behavioral therapies, including relaxation therapies. Aromatherapy is an intervention that promotes relaxation in patients with pain but is not specifically included in the list of relaxation therapies in either CPG (Czarnecki & Turner, 2018).

In September 2016, the health system's Nursing Practice Council (NPC) completed an audit of 65 open medical records from 10 hospitals to evaluate documentation of delivery of key recommendations in the Assessment and Management of Acute Pain in the Hospitalized Adult Nursing CPG (Mack et al., 2014). The audit included an assessment of the documentation of presence and type of NPPMIs provided to patients not achieving an acceptable pain goal. In the

audited patients, less than 32% of those with unmet pain goals had received a NPPMI (Appendix A). A total of 21 NPPMIs were documented; some patient records recorded more than one intervention. Of the 21 NPPMIs noted, repositioning was documented in nine records, application of cold was documented in two records, and provision of quiet environment was documented in two records. Application of heat, assistance with activities of daily living, comfort measures, distraction, education, relaxation, pressure relief, reduced stimuli, and relaxation techniques were each documented in one record. The NPC advised that additional NPPMIs for patients were needed and should be selected based on efficacy and feasibility for nursing practice.

The need for additional NPPMIs was validated by observations on bedside pain CPG rounds at each of the 10 hospitals in the health system by the advanced practice registered nurse (APRN) responsible for oversight of the CPG. Two nurses with expertise in pain management from outside of the health system were consulted regarding potential NPPMIs. These nurses identified aromatherapy as a feasible and effective intervention for clinical nurses to provide to hospitalized patients to help manage pain (D. Chapa, personal communication, September 8, 2016; T. Dintzner, personal communication, September 23, 2016). Subsequently, a systematic review of lavender aromatherapy for acute pain management in adults, defined as those ages 18 and older, was completed in December 2016 by the APRN (Mack & Zhou, 2016). Lavender essential oil was selected because it was: (a) the most frequently identified effective essential oil used in the acute pain randomized controlled trials identified in the systematic review and (b) one of the most effective scents identified in an aromatherapy observational study at a mid-west health system (Mack & Zhou, 2016; Johnson et al., 2016). In February 2017, the nurse pain expert consulted in 2014 returned to the health system to provide educational sessions and

hospital site visits to evaluate the CPG implementation (Gordon, 2017). Based on observations during these site visits, the nurse pain expert validated the need to increase the NPPMI options for nurses to provide to patients.

In August 2017, an advisory team of the health system's Nursing Leadership Development Program presented a system-level plan to fully implement the Assessment and Management of Acute Pain in the Hospitalized Adult Nursing CPG. Implementation of aromatherapy for pain management was among the recommendations in the plan.

In October 2017, the health system APRN attended the "How to Launch an Aromatherapy Program within a Hospital or Health System" course presented by the Penny George Institute for Health and Healing at Allina Health in Minnesota to develop a nurse-directed lavender aromatherapy pain management protocol and system implementation plan (Streeter, 2017). In November 2017, the health system held a Pain Summit at which a clinical nurse presented education about aromatherapy for pain management (Ryan, 2017). Development of a product trial of lavender aromatherapy for pain management and associated deliverables was begun in December 2017 and completed in August 2018 (Appendix B). Project plan steps included:

- Obtaining approval for the product by Nursing Product Evaluation and Standardization Council (NPESC) in collaboration with the health system supply chain team. NPESC required a product trial, including clinical nurses' evaluation of the lavender inhalers, prior to final approval for patient use in all hospitals in the health system. In January 2018, the supply chain team located several lavender aromatherapy products to evaluate that met safety criteria described by the Penny George Institute aromatherapist (Streeter,

2017). The NPESC approved one of the lavender products that was an inhaler for the trial.

- Development of a clinical protocol (Appendix C). The clinical protocol was vetted with health system physician subject matter experts: an allergist, a pulmonologist specializing in asthma management, and an anesthesiologist. Additional input included health system leaders from occupational health (which manages the health of employees) and laundry services (which could be impacted by aromatherapy products being inadvertently mixed with the linens) who jointly advised that the lavender inhaler was an acceptable product.
- Creation of a patient and family education lavender aromatherapy document by the NPC with consultation by a health literacy expert and endorsed by the Patient and Family Education Council (Appendix D).
- Development of nursing education on lavender aromatherapy for the product trial and endorsement for system-wide use after the trial by the Nursing Professional Development Excellence Committee (Appendices E and F).
- Development of nursing documentation for the nurse-directed aromatherapy protocol within the electronic medical records (EMR) system that is used in nine of the 10 health system hospitals. This included: (a) a clinical decision support process to assist nurses to determine the appropriateness of lavender aromatherapy, (b) prompts to document pain intensity after the first administration, and (c) fields for documentation of initial and ongoing inhaler use (see screenshots in Appendix E).
- Development of a physician communication brief highlighting key research that was vetted with physician leaders at the pilot hospitals and disseminated as part of the pilot (Appendix G).

The pilot was completed at two hospitals in August 2018 and resulted in the NPESC endorsement of the lavender Aethereo®Sticks inhaler product for system-wide implementation in September 2018. No adverse events were noted in patients, visitors, nurses, physicians, or other hospital associates during the trial. The community hospital for this study was not a pilot site. A launch brief containing product cost and ordering information was issued by the system supply chain team in November 2018 (Appendix H).

Among the 10 hospitals in the health system, the study community hospital was selected as the focus for this project, because it had not met the health system pain management patient experience target score of the Magnet hospital average in over 12 months. The community hospital scored at the 33rd percentile in the prior 12 months. In the first quarter of fiscal year 2019, the community hospital scored in the 31st percentile as compared to NRC database Magnet hospitals. The NRC database analysis indicated pain management was one of the key drivers of patients' overall rating of the community hospital on a zero to 10 scale. The surgical-orthopedic unit scores were in the lower half of study hospital's units' scores, scoring at the 30th percentile over the prior 12 months and in the 12th percentile for the first quarter of FY 2019.

Annual observational visits beginning in 2016 conducted by the health system's APRN responsible for pain management and the nurse pain expert visit in 2017 validated the community hospital's patients were not receiving cognitive NPPMIs. Due to the need for cognitive NPPMI to improve patients' pain management experience, implementation of nurse-directed lavender aromatherapy was an organizational priority supported by the community hospital's Chief Nursing Officer (CNO) and Vice-President for Medical Affairs.

Each hospital in the health system, including the community hospital for this study, convened a multidisciplinary committee, including the hospital supply chain team, to implement

the aromatherapy protocol with lavender inhalers. The community hospital's plan was impacted by the transition to the health system's EMR system on November 29, 2018. This EMR system included the documentation fields and decision support necessary for implementation of aromatherapy. To allow clinicians time to adapt to the new system, the community hospital's implementation team determined aromatherapy implementation would commence in the first quarter of FY 2019.

During this time-period, a system-wide nurse PC program began on October 31, 2018 with training for groups of nurse leaders and clinical nurses from all 10 hospitals. Clinical nurses from all inpatient units were appointed by nurse leaders to be nurse PCs. The program required each nurse PC to attend at least 75% of monthly meetings. The community hospital held its first PC meeting in the first quarter of FY 2019, on January 23, 2019.

In addition to the aromatherapy protocol that all system hospitals employed, the community hospital's implementation was fortified by this EBP project that included: (a) engaging the hospital's newly appointed nurse PCs through DNP student-facilitated meeting discussions regarding how to promote aromatherapy use and (b) providing DNP Student-led Lunch & Learn presentations and Rounding for Results sessions on the surgical-orthopedic unit to promote aromatherapy use.

Goals of this intervention were: (a) for the community hospital's surgical-orthopedic unit to meet or exceed the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) average score for Magnet hospitals based on raw, unadjusted scores in the NRC Picker database target for pain management patient experience at all hospitals and (b) for all appropriate surgical-orthopedic unit patients to receive an offer of lavender aromatherapy as an option to help manage pain.

The surgical-orthopedic unit was selected for the Lunch & Learn presentations and Rounding for Results sessions because its patients were more likely to have acute pain, with or without chronic pain, than patients in non-surgical units, who were more likely to have only chronic pain. Surgical-orthopedic patients commonly experienced both acute pain from operative procedures and chronic pain from osteoarthritis in non-operative joints (Doi, Shimoda, & Gibbons, 2014). Aromatherapy has been associated with positive effect for both acute and chronic pain, but the magnitude of effect is greater with acute pain (Lakhan, Sheafer, & Tepper, 2016). Therefore, aromatherapy was likely to benefit the pain experience of patients on this unit to a greater magnitude than those on non-surgical units.

Problem Statement

Most post-operative patients report unsatisfactory pain management that can limit surgical recovery and result in deconditioning, hypercoagulability, respiratory compromise, decreased bowel motility, and chronic pain (Chou et al., 2016). NPPMIs are recommended in addition to multimodal analgesic medications in consensus guidelines to improve pain management and decrease reliance on opioids (Chou et al., 2016; Kim et al., 2007; Mack et al., 2014; RNAO, 2013). Opioid medication risks include constipation, opioid-induced sedation, respiratory depression, and even death (Czarnecki & Turner, 2018).

Use of aromatherapy with lavender essential oil is a NPPMI (Buckle, 2015). Clinical research studies of lavender aromatherapy have demonstrated improvement in pain intensity, patient satisfaction with pain management, and decreased utilization of opioid medication (Bagheri-Nesami, Espahbodi, Nikkhah, Shorofi, & Charati, 2014; Heidari Gorji et al., 2015; Irmak Sapmaz et al., 2015; Johnson et al., 2016; Karaman et al., 2016; Kim et al., 2007; Kim et al., 2006; Lakhan et al., 2016).

Clinical observations and documentation audits of patient pain management at the health system, including the study community hospital, demonstrated that NPPMIs were not routinely provided to patients with pain (Appendix A). In those patients who received NPPMIs, body positioning to decrease pain was the most frequently documented and observed intervention. This prompted a dialogue with clinical experts and subsequent literature review of lavender aromatherapy that resulted in the selection of lavender aromatherapy as a new NPPMI for all health system hospitals.

This practice change, the initiation of nurse-directed aromatherapy, required the implementation science approach of the Iowa model of EBP to optimize adoption and sustainment (Cullen & Adams, 2012; Cullen et al., 2018). The focus of this EBP project was to improve pain management at the community hospital through fortifying the practice change of aromatherapy by engaging change agents, an Iowa model implementation strategy, including: a DNP student who provided Lunch & Learn presentations and Rounding for Results sessions on the surgical-orthopedic unit and four nurse PCs who promoted use of lavender aromatherapy on their units.

Use of the Iowa model strategy of change agents to guide lavender aromatherapy implementation for post-operative patients resulted in improved HCAHPS pain management scores. DNP student-led unit-based Lunch & Learn presentations (Appendix I), DNP student-facilitated nurse PC meeting discussions regarding how to promote aromatherapy use (Appendix J), and computer-based module completion (Appendix E) promoted the practice change of nurse-directed lavender aromatherapy for pain management by creating interest and awareness and building knowledge and commitment. DNP student-led Rounding for Results sessions promoted action and adoption of the lavender aromatherapy (Appendix K). Ongoing nurse PC meetings

and activities were identified as a method to pursue integration and sustainment through peer coaching and sharing of implementation outcome data with peers. Lavender aromatherapy EMR reports and monthly reports of inhaler usage provided by the hospital supply chain team were utilized to measure adoption of the practice change of nurse-directed lavender aromatherapy.

The project implemented and evaluated an Iowa model-guided initiative to fortify the community hospital's implementation of nurse-directed lavender aromatherapy for pain management, through DNP student and nurse PC change agents.

Purpose Statement

The purpose of this EBP project was to employ change agents (an Iowa model EBP dissemination strategy) to fortify implementation of nurse-directed lavender aromatherapy for patient pain management in a community hospital.

Practice Question

The primary clinical question for this project was:

> Was the strategy of change agents effective in achieving implementation of nurse-directed lavender aromatherapy to improve pain management experience in adult patients on a surgical-orthopedic unit of a community hospital?

Aims and Objectives

Aim

To increase the surgical-orthopedic unit patient HCAHPS pain management experience score to equal or above the Magnet average of hospitals in the NRC Picker database and to achieve a consistent practice of 100 % of appropriate patients being offered lavender aromatherapy by the end of the third quarter of FY 2019.

Objectives

- To build knowledge and commitment of clinical nurses regarding implementation of NPPMIs, particularly lavender aromatherapy.
- To engage nurse PCs to promote action and adoption of lavender aromatherapy for pain management.
- To promote integration and sustained use of lavender aromatherapy, through evaluation of HCAHPS pain experiences scores, lavender inhaler consumption reports, and EMR aromatherapy documentation reports.

Review of the Literature

Aromatherapy for Pain Management

A database search including PubMed and CINAHL using search terms of aromatherapy and pain and pain management was conducted with the help of a research librarian. The search inclusion criteria were: the population must include adults cared for in a medical-surgical unit or procedural/surgical area, the intervention must include aromatherapy with lavender, the outcome of self-reported pain must be reported, the study must have an experimental design and control, peer-reviewed journal publication, English language, and publication years of 2006 through 2016.

Six randomized controlled trials of lavender essential oil inhalation for acute pain were identified. All were conducted in an academic university or medical centers in three locations: two studies conducted in Iran, two in Turkey, and two in New York city (Bagheri-Nesami et al., 2014; Heidari Gorji et al., 2015; Irmak Sapmaz et al., 2015; Karaman et al., 2016; Kim et al., 2007; Kim et al., 2006) (Appendix L). Patient populations in five of these studies were selected because they were undergoing procedures that are typical of the hospital setting and produce

acute pain including: hemodialysis access cannulation, peripheral venous cannulation, cardiac surgery with sternotomy, gastric banding, and breast biopsy. The remaining study focused on the diagnosis of renal colic that is a medical diagnosis associated with acute pain. Aromatherapy with lavender inhalation was noted to have a significant effect on the outcome of self-reported acute pain as compared to placebo in five of the six studies with reported p values ranging from $< .001$ to $< .05$ (Bagheri-Nesami et al., 2014; Heidari Gorji et al., 2015; Irmak Sapmaz et al., 2015; Karaman et al., 2016; Kim et al., 2007). Kim and colleagues' (2006) initial study of patients undergoing breast biopsy did not note a significant difference in pain intensity between those who received placebo and those who received lavender aromatherapy, but both groups reported low levels of pain intensity. Reduction in opioid use was observed in one study (Kim et al., 2007).

In addition, a meta-analysis and a large observational study fortified the evidence for aromatherapy for pain (Johnson et al., 2016; Lakhan, Sheafer, & Tepper, 2016). A systematic review and meta-analysis of pooled data from twelve randomized controlled trials in which aromatherapy was an intervention for acute or chronic pain concluded that there was a statistically significant reduction in pain intensity and a large effect size (Lakhan, Sheafer, & Tepper, 2016). The meta-analysis demonstrated a larger magnitude of effect for acute pain than chronic pain. A large observational trial of over 5,000 administrations of lavender essential oil in a hospital system in the mid-western United States noted a mean reduction in pain intensity of three points on an 11-point scale and no associated serious safety events (Johnson et al., 2016).

The National Institutes of Health National Center for Complementary and Integrative Health (2016) provided the opinion that current aromatherapy research includes only studies of insufficient size and quality to warrant a recommendation of effectiveness of its use for symptom

relief, including pain management. This contrasts with the findings of the meta-analysis, randomized controlled trials, and observational study (Bagheri-Nesami et al., 2014; Heidari Gorji et al., 2015; Irmak Sapmaz et al., 2015; Johnson et al., 2016; Karaman et al., 2016; Kim et al., 2007; Lakhan et al., 2016).

Change Agents

Database queries including OVID® Medline, CINAHL, SCOPUS, and Clinical Key for Nursing using search terms of "Pain Champion" and "Pain Resource Nurse" were conducted. These terms are used interchangeably in the literature. The search inclusion criteria were: peer-reviewed journal publications, English language, and no limit on publication years. A search of Pain Management Nursing journal from 2007 to present using the search term "Pain Resource Nurse" was also conducted. Hand searches of articles and the references in the chapter on implementation by Cullen and colleagues (2018) were performed. Articles were organized by hierarchy of evidence and scanned content that included nurse PC program evaluations or the role of APRN pain champions, since the DNP student in this project was an APRN.

The only randomized controlled trial of the effectiveness implementation of a nurse PC program, took place in a 650-bed university-affiliated hospital in Iceland (Gunnarsdottir et al., 2017). Twelve adult medical-surgical units were randomized to initial program implementation and eleven units served as the control, with a plan to implement the program on those units in the future. A three-day training nurse PC course was provided to 24 nurses. The course was followed by a six-month process in which each nurse PC was mentored by a clinical nurse specialist (CNS). Clinical outcomes were measured before and after implementation with: (a) pain management index that evaluated pain with both pain intensity and the strength of analgesics a patient received and (b) a standardized pain questionnaire (Cleeland et al., 1994;

Gordon et al., 2010). Two nursing outcomes were measured pre and post implementation: (a) nurses' selection of an appropriate pain assessment tool, based on medical records documentation review and (b) a standardized knowledge and attitudes survey provided to all nurses in the hospital (Ferrell & McCaffery, 2014). No significant differences were found in patient pain intensity, patient pain experience, or nursing knowledge and attitudes regarding pain management. Significant improvement in nurses' selection of appropriate pain assessment tools was noted. The study was well designed because: (a) control nursing units were measured in comparison with units with nurse PCs, (b) the number of nursing units included was adequate for statistical power, and (c) both patient and nursing outcomes were measured. There were a number of limitations including: (a) the intervention focused on improving nursing knowledge, but there was no assessment of the quality of the multidisciplinary practice environment that is essential for pain management; (b) the pre and post assessment interval was six-months, despite the authors' acknowledgement that transition to the nurse PC role often requires a year or more; (c) the authors asserted that informing the leadership of the program ensured support, but did not measure the degree of leadership support nurses experienced; and (d) a lack of process or effectiveness measures for the mentorship phase.

Thirteen descriptive, qualitative and mixed methods pain champion program evaluations identified challenges, facilitators, and benefits. Challenges included: (a) sustaining leadership support, (b) time for nurse PCs to attend meetings, (c) incorporating the role during the workday, (d) visibility to peers, (e) receptiveness of nurse colleagues, (f) the slow pace of practice change, and (g) a focus on regulatory outcomes over patient outcomes (Allen et al., 2018; Ferrell, Grant, Ritchie, Ropchan, & Rivera, 1993; Ladak et al., 2013; McCleary, Ellis, & Rowley, 2004; Tong et al., 2019). Facilitators included: (a) initial didactic education on pain management and the pain

champion role, (b) nursing unit leadership support, (c) dedicated time for meetings and activities, (d) clear role expectations, (e) clinical mentors, and (f) dedicated acute pain provider teams (Ladak et al., 2013; McCleary, Ellis, & Rowley, 2004; Overstreet, 2012; Tong et al., 2019). Benefits included: (a) improved and sustained nursing knowledge, (b) sustained confidence in pain management, (c) improved documentation of pain assessment, (d) adoption of pain management practice changes, (e) improved patient pain experience, (f) decreased pain prevalence, and (g) improved patient and clinician communication about pain management (Allen et al., 2018; Eaton, Gordon, & Doorenbos, 2013; Ferrell et al., 1993; Grant, Ferrell, Hanson, Sun, & Uman, 2011; Greenway & Corston, 2016; Holley, McMillan, Hagan, Palacios, & Rosenberg, 2005; Ladak et al., 2013; McCleary, Ellis, & Rowley, 2004; McMillan, Tittle, Hagan, & Small, 2005; Overstreet, 2012; Paice, Barnard, Creamer, & Omerod, 2006; Telford, Nichols, & Watson, 2019; Tong et al., 2019).

The role of the APRN as a pain champion included: (a) patient assessment and care planning; (b) education of nurses and other clinicians; (c) developing a culture of trust with and among clinical nurses and other disciplines; and (d) protocol implementation including assessment of barriers, practice reminders, medical record audits (Kaasalainen et al., 2015; McCleary et al., 2004). Barriers in APRN implementation of protocols included: less APRN time at the bedside than clinical nurses, competition of EBP protocols with other change initiatives, clinical nurse resistance to change, and turnover in clinical nurses (Kaasalainen et al., 2015; McCleary et al., 2004). Facilitators in APRN implementation of protocols included: (a) a dedicated APRN pain champion was responsible for protocol oversight, (b) senior leadership supported the APRN role in protocol implementation, (c) an APRN provided education and

mentoring of clinical nurses regarding the protocol, and (d) an APRN applied advanced knowledge of pain medications to care planning (Kaasalainen et al., 2015).

Theoretical Framework

The Iowa Model of EBP Implementation

Implementation of evidence to practice at the health system was informed by the Iowa model of EBP for: (a) identification of the practice improvement opportunity, (b) evaluation and synthesis of evidence, and (c) evidence-based dissemination strategies (Cullen & Adams, 2012; Cullen et al., 2018). The Iowa model process for identification of the practice improvement opportunity, review of the literature, and synthesis of evidence was completed prior to the health system lavender aromatherapy pilot. Evidence for the use of NPPMIs was based on CPG evidence-based recommendations (Chou et al., 2016; Mack et al., 2014). A literature review of aromatherapy, a NPPMI that is feasible nurse-directed implementation, provided additional evidence (Bagheri-Nesami et al., 2014; Heidari Gorji et al., 2015; Irmak Sapmaz et al., 2015; Johnson et al., 2016; Karaman et al., 2016; Kim et al., 2007; Lakhan et al., 2016).

The Iowa model provided a table of evidence-based implementation strategies across four phases and two areas of focus for this EBP project, which is shown in Appendix M. The phases were: (a) create interest and awareness, (b) build knowledge and commitment, (c) promote action and adoption, and (d) purse integration and sustained use. The areas of focus were: (a) connecting with clinicians, organizational leaders, and key stakeholders; and (b) building organizational support.

Methodology

Logic Model

In addition to appraisal and synthesis of evidence, this EBP implementation required an assessment of the context of practice and the necessary resources, stakeholders, and processes to achieve the desired patient outcomes (Melnyk & Fineout-Overholt, 2011; Millar, Simeone, & Carnevale, 2001). A logic model was selected as the program planning tool (McCawley, 2001). The logic model was used to: (a) identify the priorities to be addressed in the project; (b) compare the state of clinical care prior to the project to the desired outcomes; (c) identify inputs and outputs needed to achieve these outcomes; and (d) identify assumptions and external factors that may impact the success of the project (McCawley, 2001; Millar et al., 2001). Project outcomes were segmented into three temporal types: short-term, medium-term, and long-term (McCawley, 2001; Millar et al., 2001; Taylor-Powell, Jones, & Henert, 2003).

The logic model outcomes aligned with the four dissemination phases of the Iowa model: (a) short-term outcomes included creation of interest and awareness of the need for the desired practice and knowledge and commitment required for the practice change, (b) medium-term outcomes included the action and adoption of the practice change, and (c) long-term outcomes included the integration and sustainment of the practice change and its impact on the identified need (Cullen et al., 2018; McCawley, 2001; Taylor-Powell et al., 2003) (Appendix N).

Situation.

Adult patients, ages 18 and older, in the community hospital rated their pain management experience during hospitalization with the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey. The health system HCAHPS pain experience score target for all hospitals, including the community hospital, was to meet or exceed the average

score for Magnet hospitals based on raw, unadjusted scores in the NRC Picker database. The hospital had not met this target score in over 12 months, scoring at the 33rd percentile. As of January 12, 2019, the community hospital FY 2019 performance to date improved to just below the 50th percentile as compared to all NRC database hospitals but remained at the 43rd percentile as compared to NRC database Magnet hospitals. According to the NRC database analysis report, the community hospital's pain management experience score was one of key drivers of patients' overall rating of the community hospital, on a zero to 10 scale. The surgical-orthopedic unit ranked third among its six community hospital units for pain management experience, scoring at the 30th percentile over the past 12 months.

Since 2014, the community hospital had worked to implement the Assessment and Management of Acute Pain in the Hospitalized Adult CPG that recommended cognitive NPPMI. However, during annual surveys by the health system's pain management APRN in 2016, 2017, and 2018, patients did not receive cognitive NPPMIs in the surgical-orthopedic unit or the other five inpatient units. Similarly, other hospitals in the health system had low utilization of NPPMIs.

Due to the lack of cognitive NPPMIs, lavender aromatherapy was recommended by the health system for nurses at each hospital to offer to patients. This was particularly important for the community hospital and its surgical-orthopedic unit due to below-target patient pain management experience scores. The selection of lavender aromatherapy was based on the literature review findings of the effectiveness of lavender aromatherapy for improved pain management in both acute and chronic pain, with a greater magnitude of benefit in acute pain (Lakhan, Sheafer, & Tepper, 2016). In the placebo-control studies of lavender essential oil aromatherapy for acute pain, patients who received lavender aromatherapy demonstrated less

pain intensity than those who received placebo (Bagheri-Nesami, Espahbodi, Nikkhah, Shorofi, & Charati, 2014; Heidari Gorji et al., 2015; Irmak Sapmaz et al., 2015; Karaman et al., 2016; Kim et al., 2007). The magnitude of effect of lavender aromatherapy, observed in a large observational trial in hospitalized patients, was a mean improvement in pain intensity score of three points on a 10-point scale (Johnson et al., 2016).

Priorities.

Since the community hospital resided in the state of Maryland, its patient experience scores determined 50% of the revenue from quality-based reimbursement (QBR) program (Health Services Cost Review Commission [HSCRC], 2017). In other states, patient experience scores comprised only 25% of the value-based reimbursement program (HSCRC, 2017). Although the pain experience scores were removed from the FY 2019 QBR program, the overall rating of the hospital continued to be included and pain management experience was a key driver of the community's hospitals overall rating. Over a million dollars of the community hospital's annual reimbursement was at risk under the QBR program (HSCRC, 2017).

At the start of the project, the health system's annual nursing goals included implementation of aromatherapy in all hospitals. This logic model was developed to plan for the community hospital's implementation of aromatherapy, fortify implementation with change agents, and focus on the surgical-orthopedic unit.

Inputs.

Lavender aromatherapy inhalers were placed in a dedicated bin in each nursing unit's supply rooms by the supply chain team at the nurse managers' direction. The inhalers were financed through the unit nursing budget. The inhalers used in the project had a three-month potency when opened, so only one inhaler was typically needed for each patient encounter.

Time and resources for training clinical staff on lavender aromatherapy inhalers included:

- A 15-minute aromatherapy computer-based module for 25 clinical nurses on the surgical-orthopedic unit and four of the hospital's nurse PCs.
- Three 15-minute Lunch & Learn presentations with surgical-orthopedic unit nurses that occurred during a week-day day-shift, a week-day night-shift, and a week-end day shift.
- Refreshments for the three surgical-orthopedic unit-based Lunch & Learn presentations and two nurse champion meetings, supplied by the DNP student.
- Forty lavender aromatherapy inhalers were provided free of charge by the vendor through the hospital's supply chain team and distributed to nurse PCs and clinical nurses on the surgical-orthopedic unit and other clinical staff during nurse PC meetings, Lunch & Learn presentations, and Rounding for Results sessions.

Outcomes.

Short-term outcomes.

Surgical-orthopedic unit clinical nurses, nurse PCs, and other clinicians articulated:

- Lavender aromatherapy benefits, patient assessment protocol and patient education key points.
    - The target for this outcome was all surgical-orthopedic unit clinical nurses and nurse PCs completed the computer module successfully with a score of 80% on the module evaluation.
    - The hospital nurse educator provided a de-identified health system learning management system report of lavender aromatherapy module completion.

- Intent to offer lavender inhalers to patients.
    - The target for this outcome was 100% of surgical-orthopedic unit nurses verbalize intent to offer lavender during DNP student weekly Rounding for Results sessions.
    - Evaluation was recorded on the DNP student surgical-orthopedic unit Rounding for Results form (Appendix K).
- Skill to appropriately use and teach patients to use lavender inhalers.
    - The target for this outcome was 100% of surgical-orthopedic unit patients are observed to appropriately use lavender inhalers by the end of the fourth week of the DNP Rounding for Results sessions.
    - Evaluation was recorded on the DNP student surgical-orthopedic unit Rounding for Results form (Appendix K).
- Nurse leaders established recommended par levels of lavender inhalers.
    - The target for this outcome was each week during DNP Rounding for Results sessions, the number of lavender inhalers was observed to be at par level for the day.
    - Evaluation was recorded on the DNP student surgical-orthopedic unit Rounding for Results form (Appendix K).
- Nurse leaders mentioned lavender inhalers during nurse leader patient rounds.
    - The target for this outcome was each week during DNP student Rounding for Results sessions, a verbal check-in with the nurse manager or charge nurse validated that lavender aromatherapy was mentioned during their nurse leader rounds with patients.

- Evaluation was recorded on the DNP student surgical-orthopedic unit Rounding for Results form (Appendix K).

Medium-term outcomes.

- Patients were screened for aromatherapy during the first four weeks of the project, during which the Rounding for Results sessions occurred.
  - The target for this outcome was 20% of adult surgical-orthopedic unit patients during week one of the project and increasing by 20% increments each week of the Rounding for Results sessions, to 80% on week four, measured by observations of documentation and electronic medical record reports.
  - Observations of documentation of screening of patients for lavender intolerance was recorded on the DNP student surgical-orthopedic unit Rounding for Results form (Appendix K).
  - Weekly EMR aromatherapy documentation reports were generated to provide percentage of patients with documentation of screening for contraindication or reaction to lavender essential oil (Appendix O). These reports were run in one-week time-periods with only aggregate data reported.
- Lavender inhalers were offered to appropriate patients in the surgical-orthopedic unit during the Rounding for Results sessions.
  - The target for aromatherapy offer was measured by documentation of patients' verbal agreement decision in both the Rounding for Results observations and the weekly EMR aromatherapy documentation reports.

The target for aromatherapy offer to patients who did not have contraindication to lavender was 20% of adult surgical-orthopedic unit patients during week one of the project, increasing by 20% increments each week of the Rounding for Results sessions, to 80% of patients in week four. To avoid placing undue pressure on nurses or patients no target was set for percent of patients without a contraindication who agreed to use the lavender inhaler.

  - Observations of documentation of patients' verbal agreement decision to the offer of lavender inhaler were recorded on the DNP student surgical-orthopedic unit Rounding for Results form (Appendix K).
  - Weekly EMR aromatherapy documentation reports provided percentage of patients without a contraindication to lavender aromatherapy who had documentation of the patient's decision to the offer of lavender inhaler, including the percent of patients who verbally agreed to use it (Appendix O).

- Patients self-administered the lavender inhalers as intended as measured by observations of patient use on weekly Rounding for Results sessions.
  - The target for this outcome was 100% of surgical-orthopedic unit patients were observed to self-administer lavender inhalers by the end of the fourth week of the DNP student Rounding for Results sessions.
  - Observations were recorded on the DNP student surgical-orthopedic unit Rounding for Results form (Appendix K).

Long-term outcomes.

- Surgical-orthopedic unit patients' pain was well managed as evidenced by pain experience scores.
    - The target for this outcome was surgical-orthopedic unit pain management experience scores at or above the NRC Picker database average score for Magnet hospitals by the end of the third quarter of FY 2019.
    - This outcome was measured by NRC Picker database reports that finalized eight weeks after the end of the project.
- All appropriate patients were offered lavender inhalers to help manage pain in the two-week period after the Rounding for Results sessions ended.
    - The target for documentation of patients' verbal agreement decision in period EMR report outcomes was 100% of adult surgical-orthopedic unit patients without a contraindication to lavender. To avoid placing undue pressure on nurses or patients no target was set for percent of patients without a contraindication who agreed to use the lavender inhaler.
    - Weekly EMR aromatherapy documentation reports provided percentage of patients without a contraindication to lavender aromatherapy who had documentation of the patient's decision to the offer of lavender inhaler, including the percent of patients who verbally agreed to use it (Appendix O).
    - Monthly supply chain reports evaluated if consumption matched the number of patients with documentation of agreement to use lavender

aromatherapy noted in the EMR report for all three months of the project. There was no target for consumption as this was a validation measure.

Assumptions.

The following logic model pre-project assumptions were met and facilitated implementation success:

- Lavender aromatherapy in the surgical-orthopedic unit was embraced by surgical-orthopedic unit clinicians and patients as a valuable pain management intervention as assumed, but at a slower than anticipated rate.
- Surgical-orthopedic unit patients agreed to use lavender aromatherapy.
- Surgical-orthopedic unit clinical nurses implemented and completed the protocol but there were challenges such as uncertainty of inhaler location, misunderstanding of the eligible patient population, failure to screen all patients, nurse bias that patients receiving opioids would decline, and missing documentation of aromatherapy screening and offer.
- The Iowa Model strategy of DNP student and nurse PC change agents was a valid approach for lavender aromatherapy implementation in the surgical-orthopedic unit population.
- The community hospital CNO and the hospital Vice President for Medical Affairs supported nurse-directed lavender aromatherapy.

External Factors.

The following external factors were evaluated to determine influence on the success of this logic model:

- Lavender inhaler supply.
    - Supply remained available and there were no recalls or manufacturer interruptions. The supply of lavender inhalers was sourced from one vendor in the Midwestern United States that supplied at least one other large health system.
- Regulatory reviewers were an external factor that may have altered project implementation.
    - A Joint Commission presentation at the 2019 American Society of Pain Management Nursing conference noted that regulatory reviewers may have concerns because aromatherapy is not approved by the Food and Drug Administration (FDA) for the treatment of pain (Campbell, 2018).
    - The health system patient and family education material informed patients that aromatherapy could help patients manage pain, was not intended for treatment of disease, and was not regulated by the FDA.
    - The Joint Commission did not mention aromatherapy in its August 2018 brief about NPPMIs (Joint Commission, 2018).
    - No regulatory reviews occurred at the community hospital during project implementation.
- The Maryland hospital QBR program continued to include patient experience scores as 50% of the basis for QBR reimbursement (HSCRC, 2017).

Setting

The setting was an adult inpatient surgical-orthopedic unit at a community hospital in a 10-hospital system.

Study Population

Inclusion criteria.

- Community hospital clinical nurses and the nurse manager practicing on the adult inpatient surgical-orthopedic unit and nurse PCs were included in the project.
- Adult inpatients or observation patients, ages 18 and older, experiencing acute or chronic pain or who have anticipated procedural pain, and who were cared for by clinical nurses and the nurse manager on the adult inpatient surgical-orthopedic unit were included in the project.
- The community hospital's lavender aromatherapy policy had the following exclusion criteria that aligned with those in the health system's protocol: Adult inpatients or observation patients, ages 18 and older, experiencing acute or chronic pain or who were anticipated to have procedural pain.

Exclusion criteria.

- Nurses in the community hospital practicing in units other than the surgical-orthopedic unit nurses or were not nurse PCs were excluded.
- Pregnant women, prisoners, or non-English language speakers being cared for on the adult inpatient surgical-orthopedic unit were excluded. Adults unable to verbally agree to receive lavender aromatherapy were excluded.
- The community hospital's lavender aromatherapy policy had the following exclusion criteria that aligned with those in the health system's protocol:

- Any patient-reported intolerance or allergy to the lavender plant or essential oil including true allergy with anaphylaxis, rash, and/or intolerance such as headache, nausea, or dizziness induced by the odor.
- Any cognitive or physical condition that rendered the patient unable to: (a) answer the aromatherapy assessment question regarding intolerance and allergy, (b) indicate verbal agreement to use the lavender inhaler, or (c) participate in education about lavender aromatherapy.

Subject Recruitment

This was an EBP project focused on the intervention of the Iowa model strategy of change agents in the practice environment to fortify the hospital's lavender aromatherapy implementation, a hospital-approved NPPMI.

Nurses from the community hospital's surgical-orthopedic unit and the nurse PC program were recruited to participate in this project. During the third quarter of FY 2019, the DNP student interacted with surgical-orthopedic unit clinical nurses, the surgical-orthopedic unit nurse manager, and community hospital nurse PCs. The DNP student: (a) provided Lunch & Learn sessions; (b) encouraged clinical nurses and nurse PCs to complete the computer-based module training on aromatherapy; (c) conducted Rounding for Results sessions that included observation of nursing documentation of aromatherapy in medical records, queries of nurses regarding their intent to offer aromatherapy, and observations of patients use of lavender aromatherapy inhalers; and (d) led discussions with nurse PCs about how to promote aromatherapy in the practice setting. The intent of the observations during the Rounding for Results sessions was to determine if the hospital's policy and procedure for nurse-directed lavender aromatherapy was followed, to validate correct patient use of lavender aromatherapy inhalers, and provide re-education if

correct use was not observed. No patient intervention other than nurse-directed lavender aromatherapy, a hospital-approved NPPMI, was provided. No identifiable patient information was recorded. The orthopedic-surgical unit Rounding for Results form did not include patient identifiers (Appendix K).

Consent Procedure

No consent process was performed because this was an EBP project to foster implementation of a hospital-approved nurse-directed NPPMI. As per the community hospital's aromatherapy policy, clinical nurses queried patients for self-reported contraindication or reaction to lavender essential oil, provided patient education regarding aromatherapy, and asked patients for verbal agreement to use aromatherapy before they provided lavender inhalers to patients. The verbal agreement process was included in the health system protocol for lavender aromatherapy for pain management and community hospital's nurse-directed aromatherapy policy and procedure based on the advice of the health system's legal counsel, who also advised that written consent was not required. Any patients who self-reported a contraindication or reaction to lavender essential oil were not offered the lavender inhaler. No additional process to obtain consent occurred in this EBP project.

Risks/Harms

The potential risk to patients included harm due to allergic reaction or intolerance to lavender essential oil. Patients who reported a history of allergy or sensitivity to lavender essential oil were not offered an inhaler. A pulmonologist specializing in asthma management was consulted and after review of the evidence, recommended against including asthma on the list of contraindications (A. Shorr, personal communication, May 11, 2018). Essential oils used in this project did not contain proteins and were highly unlikely to cause a Type I allergic

reaction (Buckle, 2015). Allergy with IgG antibodies was a risk with exposure to essential oils, the same risk as any compound (J. Baraniuk, personal communication, May 23, 2018). However, this type of allergic reaction to essential oils has not been commonly reported (Buckle, 2015). Use of lavender essential oil has not been associated with clinical worsening of asthma (Buckle, 2015). Seven clinical trials reported no serious patient events (Bagheri-Nesami, Espahbodi, Nikkhah, Shorofi, & Charati, 2014; Heidari Gorji et al., 2015; Irmak Sapmaz et al., 2015; Johnson et al., 2016; Karaman et al., 2016; Kim et al., 2006; Kim et al., 2007). Two health systems, Allina Health and New York Presbyterian, reported no serious patient or associate safety events with use in multiple hospitals over multiple years (Joswiak et al., 2016; J. Seley, personal communication, May 30, 2018). No patient, visitor, nurse, physician, or other associate safety events were reported in the product trial at two of the community hospitals' sister health system hospitals in August 2018. No patient, visitor, nurse, physician, or other associate safety events were reported during this project.

No demographic or other identifying data was captured for this project and only aggregate data were reported. There was no risk of patient identification in the collected or reported data.

Potential benefits included:

- Nurses may have experienced increased role satisfaction through the opportunity to impact patients' pain experience and personal wellness using the lavender inhalers for personal use.
- Patients may have experienced improved pain management through use of lavender aromatherapy including decreased need for analgesic medications, including opioids. Patients who were observed to be using the inhaler incorrectly

experienced enhanced safety and effectiveness of aromatherapy through re-education that was provided by the DNP student.

Subject Costs and Compensation

There were no costs to subjects for the aromatherapy inhalers. The aromatherapy inhalers were non-chargeable items provided through the unit cost centers. Clinical nurses were provided lavender inhalers for personal use as part of the educational sessions and these were supplied free of charge from the lavender inhaler vendor. Clinical nurses on the surgical-orthopedic unit and nurse PCs participated in training and meetings during worked hours. Refreshments for the PC meetings and Lunch & Learn sessions were provided by the DNP student.

Study Interventions

The study interventions employed the strategy of a DNP student and nurse PC change agents through the following activities:

- Encouragement of nurses to complete an aromatherapy computer-based training module during the following interactions: nurse PC meetings, Lunch & Learn presentations, and Rounding for Results sessions.
- Two DNP student-facilitated nurse PC meeting discussions regarding how to promote aromatherapy use (Appendix J).
- Three Lunch & Learn aromatherapy presentations for surgical-orthopedic unit clinical nurses (Appendix H).
- Four DNP student-led Rounding for Results sessions with clinical nurses on the surgical-orthopedic unit (Appendix K).

- Development of reports including supply chain monthly lavender inhaler usage and EMR aromatherapy documentation reports that nurse PCs reviewed at their meetings and planned to review on an ongoing basis.

Outcomes Measured

Short-term, medium-term, and long-term outcomes were measured as noted in the Logic Model (Appendix N).

Project Timeline

Congruent with the community hospital aromatherapy implementation action plan in Appendix P, the project began on February 14, 2019 and was completed on March 30, 2019. Lunch & Learn presentations occurred on February 14, 2019 and February 16, 2019. Rounding for Results sessions occurred on February 19, 2019; February 26, 2019; March 5, 2019; and March 12, 2019. Nurse PC discussions occurred on February 28, 2019 and March 27, 2019. Weekly aromatherapy reports contained data from February 17, 2019 through March 30, 2019. The action plan incorporated the Iowa model recommendation to include strategies for all four phases of practice change (Cullen et al., 2018).

Resources Utilized

Lavender aromatherapy inhalers for patients were financed by the budgets of all inpatient nursing units, including the surgical-orthopedic unit, and located in a dedicated space on the units' supply rooms.

Forty lavender aromatherapy inhalers were provided to clinical staff, including four nurse PCs, to try personally and were secured free of charge by the vendor through the hospital's supply chain team.

Time and resources for training clinical staff on lavender aromatherapy inhalers was provided. This included:

- A 15-minute aromatherapy computer-based module for 24 clinical nurses on the surgical-orthopedic unit and four hospital nurse PCs.
- Three 15-minute Lunch & Learn sessions for nurses at three sessions.
- Two aromatherapy discussions at the regular monthly nurse PC meetings that were approximately 30 minutes in length.
- Refreshments for three nurse PC meetings and three surgical-orthopedic unit-based Lunch & Learn sessions for clinical nurses on the surgical-orthopedic unit were supplied by the DNP student.

Evaluation Plan

Observational data was captured on the DNP student Rounding for Results form with no patient identifiable data (Appendix K). EMR reports of aggregate data derived from aromatherapy documentation fields on the surgical-orthopedic unit were generated weekly by the health system informatics team and supplied to the DNP student as de-identified cases (Appendix O). Inhaler consumption reports were supplied by the hospital supply chain team via email to the DNP student. A password-protected Excel workbook was used for data capture and analysis (Appendix Q).

Data Analysis, Maintenance & Security

The data analysis plan was comprised by three appendices: (a) plan for project primary clinical question data analysis (Appendix R), (b) plan for project aims data analysis (Appendix S), and (c) plan for project logic model outcomes data analysis (Appendix T). No tests of statistical significance were performed. Descriptive statistics are provided for categorical and

numerical data compiled from the DNP student Rounding for Results form, the weekly de-identified EMR aromatherapy documentation reports, and the hospital supply chain team inhaler consumption reports. Qualitative data including barriers, facilitators and comments compiled on the DNP student Rounding for Results form were categorized and summarized in the Excel workbook and noted in the reporting of results. Weekly EMR aromatherapy documentation report data were transcribed into the same Excel workbook as the Rounding for Results forms. The Excel worksheets were queried for empty cells. No identified data were stored. The Excel workbook was a password-protected file stored on a password-protected health system-owned laptop with the organizational antivirus and threat protection software. Backup files were password protected and stored on a password-protected and encrypted USB drive compliant with the health system standards. No paper copies of Rounding for Results forms were stored. No paper copies or electronic files of the EMR aromatherapy documentation reports were stored.

Anticipated Findings

Rates of clinical nurse and patient participation were anticipated to be low initially and to increase over the course of the project. This pattern was anecdotally observed in the pilot at another hospital in the health system where it was noted that nurse interest increased when patients described the effectiveness to their nurses and when nurses observed a lessening of pain because of the use of the lavender inhaler.

Anticipated barriers were: (a) nurses' hesitancy to add another task to their already busy clinical day and (b) patient disinterest in aromatherapy, although this was not observed in the pilot.

It was anticipated that the addition of nurse PC support and DNP student Rounding for Results sessions would promote lavender aromatherapy utilization. Sustainment and integration

of aromatherapy use through the nurse PC program's ongoing aromatherapy promotion and data review was anticipated. Improvement of HCAHPS pain management experience scores was expected. Decreases in pain intensity and opioid medication use in patients who receive aromatherapy reported in the literature were possible outcomes.

Results

Primary Clinical Question Results

The results for the primary clinical question "Was the strategy of change agents effective in achieving implementation of nurse-directed lavender aromatherapy to improve pain management experience in adult patients on a surgical-orthopedic unit of a community hospital?" included measures of intervention feasibility and the clinical outcome of improved patient pain experience (Appendix U).

Interventions Results

The logic model output activities, which engaged change agents, included: three DNP Student-led Lunch & Learn presentations, four DNP student-led weekly Rounding for Results sessions and two DNP-facilitated nurse PC discussions. All three interventions were feasible and the project outcome of implementation of the bundle of all three interventions was met.

Three Lunch & Learn presentations were attended by a total of 21 surgical-orthopedic unit associates. The range among roles of attendees was: 14 Registered Nurses, six Certified Nursing Assistants, and one Unit Secretary. The number of attendees per presentations ranged from five to nine. The mean number of attendees per presentation was seven.

Four DNP student-led weekly Rounding for Results sessions were completed with a total of 78 patients, a mean of 20 patients evaluated per session, and a range of 18-21 patients per session.

Two DNP-facilitated nurse PC discussions were attended by four nurse PCs and three to four PC program leaders at each session, including the DNP student, with a mean attendance of 7.5 and a range of seven to eight attendees. Although 14 nurse PCs were anticipated to participate in the program, only four attended either meeting and three attended both meetings. The nurse PCs represented four of seven inpatient medical-surgical units, including the surgical-orthopedic unit.

Clinical Outcome Results

The intervention of engaging change agents was effective in achieving implementation of nurse-directed lavender aromatherapy to improve pain management experience in adult patients on a surgical-orthopedic unit of a community hospital. The surgical-orthopedic unit patient pain management experience percentile rankings increased during the implementation period. Before implementation the surgical-orthopedic unit scores were below target. In the first quarter, the scores were 52.2% positive, ranking in the 12th percentile as compared to Magnet hospitals in the NRC Picker data base. In the second quarter, the scores were 63.0 % positive, ranking in the 43rd percentile, but the reliability of the second quarter scores was limited by a small sample size. After implementation in the third quarter, the surgical-orthopedic unit score increased to 72.2% positive, ranking at the 78th percentile and exceeding the target. Before implementation the community hospital score was: (a) below target in the first quarter at 59.3% positive, ranking in the 31st percentile; and (b) above target in the second quarter at 63.3 % positive, ranking in the 56th percentile. After implementation in the third quarter, the community hospital score decreased below target at 64.1% positive, ranking at the 46th percentile. Although the surgical-orthopedic unit scores and ranking increased markedly during implementation, the community hospital ranking decreased slightly, although the score itself increased.

Project Aims Results

Project aims data are reported in Appendix V.

The first project aim was to increase the surgical-orthopedic unit patient HCAHPS pain management experience score to equal or above the Magnet average of hospitals in the NRC Picker database by the end of the third quarter of FY 2019. This aim was met with a score of 72.2% positive that ranked at the 78th percentile.

The second aim was 100% of surgical-orthopedic unit patients who were documented to have no contraindication to lavender aromatherapy receive an offer of lavender aromatherapy each of the six weeks of the project. This aim was not met but was nearly achieved.

Based on surgical orthopedic unit EMR data, 33 of 34 eligible patients received the offer, missing the aim by one patient on week three. The range of weekly percentages was 91.7% on the third week to 100% on the other five weeks. The mean weekly percentage was 97.1%. Based on the total of the four weekly Rounding for Results session observations of medical records, eight of nine patients, 88.89%, who had documentation of no contraindication to lavender aromatherapy received an offer of lavender aromatherapy. Of the nine patients who were screened, one declined the offer, so the nurse did not chart the education or response to the offer. The DNP student re-educated the nurse on the protocol and she verbally indicated she would correct the documentation when she next charted.

The frequency that patients were screened impacted the reliability of the measure. The rates of documentation of screening for lavender contraindication in the EMR aromatherapy documentation reports ranged from 16.7% to 50.0% of surgical-orthopedic unit patients weekly. During the four Rounding for Results sessions, 38 of 78 patients, 49%, were potential users of aromatherapy, because they were not cognitively impaired and could verbalize agreement to use

the aromatherapy, which was a required element in the hospital policy. Only nine of these 38 patients, 23.7%, were observed to have screening for contraindication documented. One patient was screened but did not receive education. Eight patients had documentation of an offer for aromatherapy and the other patient who was offered but declined did not have this documented.

Nurses were often engaged in other patient care activities during the Rounding for Results sessions, which did not allow time for them to be directly mentored by the DNP student. Nurses were willing to offer aromatherapy and indicated they would assess the patients later in the shift. Based on the EMR data during that same four-week period, 24 of 25 patients with no documentation of contraindication received aromatherapy as compared to eight patients during the Rounding for Results sessions. These data confirm that nurses screened and offered patients aromatherapy outside of the Rounding for Results sessions.

Logic Model Outcomes

Logic model outcomes data are reported in Appendix W.

Short-term outcome results.

The first short-term outcome was that surgical-orthopedic unit clinical nurses, nurse PCs, and other clinicians would articulate lavender aromatherapy benefits, the patient assessment protocol, and key points for patient education demonstrated by a score of at least 80% on the 15-minute computer-based aromatherapy learning module post-test. This outcome was met for all surgical-orthopedic unit clinical nurses because all 24 successfully completed the post-test. The outcome was met for all four nurse PCs who verbally indicated they completed the module. However, the verbal reports could not be validated with queries by name, since the learning management system report was de-identified. It was not possible to determine the percentage of all clinicians who completed the module. In addition to the surgical-orthopedic clinical nurses,

an additional 305 community hospital associates successfully completed the module for a total of 329 associates: 225 clinical nurses practicing in direct care, 32 certified nursing assistants, 18 nurse leaders, 12 technicians, 11 non-direct care nurses, 10 unit-secretaries, eight physicians' assistants/surgical assistants five transporters, three advanced practice registered nurses, two nurse educators, two licensed practical nurses and one physician.

The second short-term outcome measured the intent of surgical-orthopedic unit clinical nurses to offer lavender inhalers to patients. The target for this outcome was 100% of surgical-orthopedic unit nurses would verbalize intent to offer lavender during DNP student weekly Rounding for Results. This outcome was not met but was nearly achieved. During the first three of four weekly Rounding for Results sessions, all nurses on duty articulated to the DNP student their intent to offer lavender aromatherapy inhalers to patients. On the final week, five of the six nurses on duty also indicated intent to offer lavender aromatherapy inhalers to patients. The remaining nurse was very busy caring for several complex patients. The nurse understandably commented that providing aromatherapy was not a priority and she did not have time to discuss aromatherapy at all. In summary, in 22 of 23 encounters, 96% of the time, nurses indicated intent to offer lavender aromatherapy inhalers.

The third short-term outcome was surgical-orthopedic unit clinical nurses would demonstrate the skill to appropriately use and teach patients to use lavender inhalers measured by observation of surgical-orthopedic patient use of the inhalers. The target for this outcome was 100% of surgical-orthopedic unit patients who received inhalers would demonstrate correct use by the end of the fourth week of the DNP Rounding for Results sessions. This outcome was not met. Only three of eight patients, 37.5%, demonstrated and verbalized correct use. On weeks one, two, and three, 50% of patients, one per week, correctly verbalized and demonstrated use,

and on week four neither patient of the two patients verbalized and demonstrated correct use. All patients were given written instructions that the nurses verbally reviewed with them. The written instructions were at a fifth-grade reading level and were vetted by a health literacy expert. Of the five patients who required re-education on lavender aromatherapy inhaler use, all misunderstood the frequency of use. The inhaler can be used up to four times per hours. Four patients stated it could be used only every four hours and one stated every six hours. No patients were observed to use the device in an unsafe manner; one patient was unsure how near to the nose to hold the inhaler. Several of these patients had recently been admitted to the unit and some were in the immediate post-operative period, which may have limited understanding of the instructions.

The fourth short-term outcome was surgical-orthopedic unit nurse leaders would establish recommended par levels of lavender inhaler. The target for this outcome was each week during DNP Rounding for Results sessions, the number of lavender inhalers would be observed to be at par level for the day in the unit's supply rooms. This outcome was met. On all four weeks the DNP student observed inhalers were available in both supply rooms of the unit. Nurse leaders established recommended par levels of lavender inhalers initially at five inhalers per supply room and on the second week increased the number to 10 inhalers per supply room. At the time of the Rounding for Results sessions, which occurred in the afternoon hours each week, the number of inhalers in the supply room bins ranged from three to 10. Accounting for inhalers placed in use earlier in the day, the par levels were adequate.

The fifth short-term outcome was that the surgical-orthopedic unit nurse leaders would verbally report to the DNP student that they mentioned lavender aromatherapy inhalers to the

patients during nurse leader patient rounds on all four weeks of the Rounding for Results sessions. This outcome was met.

Medium-term outcome results.

The first medium-term outcome was surgical-orthopedic patients would be screened for aromatherapy during the first four weeks of the project. The target for this outcome was 20% of adult surgical-orthopedic unit patients during week one of the project, increasing by 20% increments each week of the Rounding for Results sessions, to 80% on week four. This outcome was measured by observations of documentation during the Rounding for Results sessions and the EMR aromatherapy documentation reports.

In the Rounding for Results sessions, the target was not met on any of the four weeks. In all four weeks combined only nine of 38 patients, 23.7%, who could have potentially benefited from lavender aromatherapy were screened at the time of the Rounding for Results sessions. Screening ranged from 16.7% of patients on the first and second weeks to 50% of patients on third week to 25% of patients on fourth week. Patients were excluded if they did not report pain or if their cognitive status prevented education about aromatherapy or the ability to verbally agree to use aromatherapy. Barriers observed during Rounding for Results sessions included: (a) a patient having nausea at the time of rounds; (b) lack of documented pain assessment; (c) nurses' decisions not to document the aromatherapy assessment when patients declined to use it; (d) one nurse's misperception that lavender aromatherapy was limited to only post-operative orthopedic procedure patients, despite the policy to offer to all patients having pain; (e) travel nurses' lack of awareness of lavender aromatherapy because they were not provided the lavender aromatherapy computer-based training and did not attend the Lunch & Learn presentations; (f) nurses' difficulty finding the lavender aromatherapy inhalers in the supply room until shown the

location by the DNP student; and (g) nurses stated-bias that patients receiving opioids would decline the lavender aromatherapy, so they did not ask these patients. The nurse who thought lavender aromatherapy was limited to only post-operative orthopedic procedure patients misunderstood a nurse leader who asked that nurses focus on this group of patients. The nurse leader had not intended her comment to exclude other patients having pain. Eight patients reported pain on previous days when lavender aromatherapy should have been considered but their pain resolved at the time of the Rounding for Results session; these patients were included in the denominator.

In the weekly EMR aromatherapy documentation reports, the target was only met on the first week when 25% of patients had documentation of screening and the target was 20%, the lowest of the four weekly targets. In all four weeks combined only 25 of 149 patients, 16.7%, who were admitted to the unit had documentation of screening. Screening ranged from 3.1% of surgical-orthopedic unit patients on the fourth week to 26.7% patients on the third week.

However, the surgical-orthopedic unit screened more patients that the other six inpatient units combined. Over this same four-week period, only 34 of 4,112 patients on all seven inpatient units, including the surgical-orthopedic unit patients, had documentation of screening for aromatherapy. This was less than one percent of patients compared with 16.7% of patients admitted to the surgical-orthopedic unit. These 34 surgical-orthopedic unit patients constituted 61% of all community hospital patients screened for aromatherapy. The comparison of weekly percentages of patients screened for lavender aromatherapy on the surgical-orthopedic unit to all inpatient units is provided in a run chart (Appendix X).

The second medium-term outcome was appropriate surgical-orthopedic patients would be offered lavender aromatherapy during the first four weeks of the project. The target for this

outcome was 20% of adult surgical-orthopedic unit patients during week one of the project, increasing by 20% increments each week of the Rounding for Results sessions, to 80% on week four. This outcome was measured by observations of documentation during the Rounding for Results sessions and the weekly EMR aromatherapy documentation reports. To avoid placing undue pressure on nurses or patients no target was set for percent of patients without a contraindication who agreed to use the lavender inhaler.

In the Rounding for Results sessions, the target was met all four weeks. Documentation of aromatherapy offer was observed in eight of the nine patients, 88.89%, who were screened over the four-week period.

In the weekly lavender aromatherapy EMR reports, the target was met three of four weeks: Documentation of aromatherapy offer was observed in 100% of patients who were screened in the first, second, and fourth weeks and 92% of patients in the third week. In all four weeks combined 24 of 25 patients, 96%, who were screened for aromatherapy were offered aromatherapy. As previously discussed, there were likely more patients who were appropriate for aromatherapy who were not screened. The frequency that patients were screened impacted the reliability of the measure both in the Rounding for Results data and the electronic medical reports data.

There was no target for percent of patients without a contraindication to agree to use the lavender inhaler to avoid placing undue pressure on nurses or patients. The documentation data in the weekly EMR aromatherapy documentation report indicated all 24 patients who were screened and offered aromatherapy agreed to use it. This may be an overestimation of patient agreement to use lavender aromatherapy because the DNP student observed during the Rounding

for Results sessions that nurses did not consistently document the aromatherapy assessment when patients declined.

The third medium-term outcome was self-administration of the lavender inhalers as intended, measured by observations of patient use during each weekly Rounding for Results session. The target that all surgical-orthopedic unit patients who received inhalers would demonstrate correct use was not met on any of the four weeks. Only three of eight patients, 37.5%, demonstrated and verbalized correct use. Additional discussion of this outcome is located on pages 45-46.

Long-term outcome results.

The long-term outcome of well-managed patient pain experience was met, evidenced by surgical-orthopedic unit pain management experience scores at or above the NRC Picker database average score for Magnet hospitals by the end of the third quarter of FY 2019. As noted on in the evaluation of the primary clinical question on page 42, the surgical-orthopedic unit patient pain management experience improved by 35 percentile ranks during the implementation period. Before implementation, the surgical-orthopedic unit scores were below target. In the first quarter, the scores were 52.2% positive, ranking in the 12th percentile as compared to Magnet hospitals in the NRC Picker data base. In the second quarter, the scores were 63.0 % positive, ranking in the 43rd percentile, but the second quarter scores reliability was limited by a small sample size. In the third quarter, during implementation of lavender aromatherapy, the surgical-orthopedic unit score increased to 72.2 percent positive ranking at the 78th percentile.

Before implementation, the community hospital scores were below target in the first quarter at 59.3% positive, ranking in the 31st percentile, and above target in the second quarter at

63.3 % positive, ranking in the 56th percentile. After implementation in the third quarter, the community hospital score decreased below target at 64.1% positive, ranking at the 46th percentile, although the score itself increased. While the surgical-orthopedic unit scores increased 35 percentile ranks during implementation, the community hospital scores decreased 10 percentile ranks.

The second long-term outcome that all appropriate surgical-orthopedic unit patients were offered lavender inhalers during weeks five and six of the project was met. This outcome was measured by the weekly EMR aromatherapy report. Weeks five and six occurred after the Rounding for Results Sessions were finished. Appropriate patients were defined as those with documentation of screening and no contraindication to lavender aromatherapy. The outcome denominator included only the nine patients with documentation of screening as compared to the 71 patients admitted to the unit during those two weeks including: seven of 41 patients, 17.5%, admitted the fifth week and two of 31 patients, 6.5%, admitted the sixth week. All nine of the patients had documentation that they verbally agreed to use lavender aromatherapy. In the six weeks of the project combined, only 34 of 220 surgical-orthopedic unit patients, 16%, had documented screening. The effectiveness of this measure relied on patients being screened and this screening documented. As discussed previously, the frequency that patients were screened impacted the reliability of the measure.

Use of lavender aromatherapy was also measured indirectly through monthly supply chain consumption reports of lavender inhalers. Consumption was compared to the number of patients with documented agreement to use an inhaler. In February and March on the surgical-orthopedic unit, 144 inhalers were consumed as compared with only 33 patients who were documented as agreeing to use an inhaler. During this same time on all inpatient units, including

the surgical orthopedic unit, 419 inhalers were consumed as compared with 55 patients who were documented as agreeing to use the inhalers.

Possible reasons for the discrepancy between inhaler consumption and the number of patients documented as agreeing to use an inhaler were: (a) patients used more than one inhaler, which was noted on more than one occasion when a nurse did not realize the patient already had one; (b) inhaler use was not documented because some nurses indicated they were not sure where to document but provided the inhaler; and (c) inhalers were removed by clinicians but not given to the patients. The inhalers were a non-charge item and could be removed by anyone with access to the supply room.

In the month following the project, inhaler consumption increased in both the surgical-orthopedic unit and all inpatient units combined. The surgical-orthopedic unit monthly inhaler consumption was 69 the first month, 75 the second month, and 79 the month after the project. The combined inpatient inhaler consumption was 207 the first month, 212 the second month, and 250 the month after the project. Over the three-month period, the surgical-orthopedic unit consumed 33% of the inhalers purchased by the community hospital inhalers, while the unit's patient volume was only 3.5% of hospital inpatient admissions.

Discussion

Implications for Practice

The change agent strategy of Rounding for Results and Lunch & Learn sessions on the surgical-orthopedic unit was feasible and effective. The surgical-orthopedic unit implemented a disproportionate majority, 61%, of the community hospital's documented screenings for aromatherapy and was responsible for 33% of the hospital's consumption of lavender inhalers, despite only admitting 3.5% percent of all inpatients. Surgical-orthopedic unit pain experience

scores increased by 35 percentile ranks and met the Magnet hospital average target during implementation, while the community hospital overall decreased by 10 percentile ranks and did not meet the Magnet hospital average target.

The DNP student change agent had the opportunity to identify and mitigate point of care barriers that are often unforeseen in the project planning stage. In this project, the DNP student mitigated the barriers observed in the Rounding for Results sessions as follows: (a) assisted nurses with locating the inhalers; (b) communicated the difficulty locating inhalers to the nurse leaders, who then assisted nurses on all shifts to find them; (c) identified travel nurses had not completed the computer-based module and communicated this to the nurse educator, who then corrected the learning plan for travel nurses; and (d) observed nurses' bias that patients who were receiving opioids would not want to try the lavender aromatherapy and addressed it by role modeling the discussion with these patients at the bedside and communicating aromatherapy patient success stories to the nurses.

In addition to the computer-based learning module that was completed by nurses in all health system hospitals, the surgical-orthopedic unit nurses received: (a) Lunch & Learn sessions attended by 14 of the 24 nurses; (b) real-time coaching by the DNP student during four Rounding for Results sessions; and (c) aromatherapy huddles provided by the unit nurse PC in provided to multiple shifts during the project. Despite the enhanced education and coaching, the adoption of the practice change of lavender aromatherapy was slower than anticipated. Computer-based modules provided basic knowledge for the practice change, while point-of-care rounding provided reminders, role modeling, and information clarification. Point-of-care rounding facilitated commitment, action and adoption of the change, but not as rapidly as expected.

The impact of the change agent strategy of unit-based pain champions was limited in this project for several reasons: (a) only four of the seven units were represented at the nurse PC program meetings when aromatherapy was discussed; (b) the nurse PC program was new and the aromatherapy discussions occurred just after inception, in the programs' second and third meetings; and (c) aromatherapy was the first project implemented by the nurse PCs. Transition to new nursing roles often take at least one year (Gunnarsdottir et al., 2017). Several nurse PCs indicated initial hesitancy to discuss practice change with peers and uncertainty as to how to conduct unit-based huddles to promote aromatherapy. The four nurse PCs overcame these challenges and reported promoting aromatherapy on their units through huddles and/or peer coaching.

Implications for Healthcare Policy

DNPs possess the knowledge, skills and attitudes required to act as change agents to foster action and adoption and sustainment and integration of EBP (Kleinpell, 2014). This project required DNP competencies for: (a) location, appraisal and synthesis of evidence; (b) project development and execution through a logic model; (c) incorporation of the Iowa model dissemination strategy of change agents; (d) utilization of EMR documentation data; (e) patient advocacy; and (e) advanced practice mentorship of clinical nurses (American Association of Colleges of Nursing [AACN], 2006; Taylor-Powell et al., 2003). Funding is needed to develop high-quality research to measure the impact of the DNP role on EBP implementation (Kleinpell, 2014). For example, the review of the literature, spanning over 25 years, regarding the nurse PC role revealed: (a) only one randomized controlled trial that was conducted in Iceland, and (b) 15 observational and qualitative studies from Australia, Canada, China, and the United States (Allen et al., 2018; Eaton et al., 2013; Ferrell et al., 1993; Grant et al., 2011; Greenway & Corston,

2016; Gunnarsdottir et al., 2017; Holley et al., 2005; Kaasalainen et al., 2015; Ladak et al., 2013; McCleary et al., 2004; McMillan, Tittle, Hagan, & Small, 2005; Overstreet, 2012; Paice et al., 2006; Telford, Nichols, & Watson, 2019; Tong et al., 2019). Additional high-quality nurse PC research studies are needed to identify key interventions for nurse PCs and DNP/APRN mentors and demonstrate clinical outcomes.

The challenge of funding nurse PC programs was described across geographic locations, settings of community hospitals and academic medical center, and throughout the 25-year timespan of the literature (Allen et al., 2018; Grant et al., 2011; Gunnarsdottir et al., 2017; Ladak et al., 2013; McCleary et al., 2004; McMillan, Tittle, Hagan, & Small, 2005; Tong et al., 2019). Nurse PCs require funding to advance their subject matter expertise through educational conference attendance, meet as a community of practice, and do the work of improving practice by conducting unit-based education, rounds, and quality improvement projects. Policy is needed to promote, fund, and recognize the resources required to implement and sustain this role.

Implications for Executive Leadership

The role of executive leadership in change initiatives includes: (a) evaluating if the proposed initiative is likely to create excellence; (b) identifying and securing the resources required for the initiative to achieve excellence; (c) communicating the requirements to key stakeholders from other disciplines and within nursing, including clinical nurses, unit nursing leaders, nursing informatics specialists, nursing practice specialists, nursing quality specialists, and nursing professional development specialists; and (d) setting a cadence for data-driven reporting of initiative milestones and impact to key stakeholders (McBride, 2011) . The community hospital CNO evaluated the potential of the project to improve patient pain experience that was an organizational priority with both reputational and financial impact for the

hospital. The CNO communicated her support to: (a) the hospital President and the Vice President for Medical Affairs; (b) the senior director for nursing who engaged unit managers, nurse educators, and the supply chain leader to support the initiative; and (c) all associates, by authoring a hospital newsletter article in collaboration with the DNP student. The CNO also invited the DNP student to present the project overview including information about lavender aromatherapy and the role of the DNP student and nurse PC change agents to the hospital Patient and Family Quality and Safety Council. The surgical-orthopedic unit nurse manager supported the initiative by: (a) attending one of the Lunch & Learn sessions to show support; (b) ensuring that lavender aromatherapy was included in nurse leader rounds with patients, which was verbally validated each week at the Rounding for Results sessions; and (c) reinforcing the importance of lavender aromatherapy as part of her role as the hospital leader of the nurse PC program.

Despite these key tactics, the adoption of the practice change was slower than anticipated, even on the surgical-orthopedic unit. The project was structured with a six-week timetable, a logic model, and more educational and coaching interventions than typical for the community hospital to include in a practice change project. The logic model addressed anticipated challenges but did not identify all challenges encountered, including the slower than expected adoption of the practice change. The experience of slow and complex practice change was consistent with the findings of a survey of CNOs: 44% did not feel EBP could be implemented in timely manner and half were unsure of the steps required for a successful practice change (Melnyk et al., 2016). Based on Rounding for Results sessions observations by the DNP student, the community hospital CNO requested additional rounds by the hospital's CNS and nurse educators to assist clinical nurses on all units in locating the lavender inhalers and documenting

aromatherapy. Like the community hospital CNO, executive leaders may need to fortify practice change with additional resources.

Implications for Quality/Safety

Most patients who agreed to use it lavender aromatherapy did not understand the frequency correctly, despite receiving education. These patients thought aromatherapy could only be used hours apart instead of four times an hour, which could have limited the impact for pain management. The patient education material had been vetted with a health literacy expert for readability, was fifth grade level, and was only one page in length. However, patient readiness to learn was limited because patients often had undergone a surgical procedure or had just arrived on the surgical-orthopedic unit. Use of the teach-back technique, for bi-directional communication between patient and nurse, had been promoted by the community hospital's health system (Brown, Mack, Guzetta, & Tefera, 2014). However, based on the observations of these patients, clinical nurses may not have been comfortable or felt they had time to use teach-back as part of the patient education process. Evaluation of the effectiveness of lavender aromatherapy education effectiveness was required to achieve quality and safety.

Development and utilization of EMR reports was another feature of this project. The EMR aromatherapy documentation report was designed to measure the frequency of patient screening and offers of aromatherapy. However, without establishment of benchmarks for the percentage of patients who were candidates for aromatherapy, the report's meaning to nurse leaders was limited. Based on the Rounding for Results observations, a recommendation was made to limit the patient denominator to only those with pain to improve its usefulness. The comparison of the supply chain data to the EMR reports revealed lavender aromatherapy documentation did not match actual patient use. This was shared with nurse PCs who worked to

foster accurate documentation on their units. EMR reports were a useful tool to evaluate the practice change but required point-of-care validation to ensure quality.

Although patient allergic reaction to lavender aromatherapy is rare, one patient observed in the Rounding for Results session verbalized a pre-existing intolerance, so no lavender aromatherapy inhaler was provided (Buckle, 2015). Intolerance screening as a component of nurse-directed lavender aromatherapy was an important safety process.

Plans for Sustainability and Future Scholarship

The integration and sustainment strategy for lavender aromatherapy included a plan for ongoing nurse PC unit activities: review of EMR aromatherapy documentation reports, review of patient pain management experience scores, observation of patient aromatherapy use, audits of EMR documentation, and educational huddles for peers. The hospital's CNS planned to continue to mentor the nurse PCs, monitor lavender aromatherapy documentation and patient experience scores, and provide unit-based pain rounds that included promoting the use of lavender aromatherapy. The community hospital's nurse PC program was part of the health system's nurse PC program that included ongoing review of system-wide EMR aromatherapy documentation reports and patient experience data, promotion of best practices for pain management through nurse PC system meetings, and facilitation of monthly PC program leader meetings. The hospital's CNS was also a member of a system-wide committee of nursing practice leaders that conducted ongoing review of system-wide EMR aromatherapy documentation reports and patient experience data.

The Rounding for Results observations provided observations to improve the utility of the EMR aromatherapy documentation reports. Once the reports capture the appropriate

patients, a large observational study of aromatherapy effectiveness of similar design to the study conducted by Johnson and colleagues (2016) could be completed.

The frequency and dose of opioid medication use in patients receiving lavender aromatherapy from EMR data is another outcome of interest for future scholarship. Although decreases in pain intensity and opioid medication use in patients who receive aromatherapy were reported in the literature, these outcomes were not measured in this project. One nurse PC anecdotally reported a patient decided to use the lavender aromatherapy during the day and opioids only at night to decrease pain to sleep. The patient expressed effective pain management with this approach.

The community hospital planned to engage nurse PCs in future implementation of TENS as another NPPMI. The TENS implementation planning included the methodology of this EBP study: a logic model, the Iowa model strategy of nurse PCs, and electronic medical reports to measure documentation and prevalence of use.

Conclusion

The intervention of engaging change agents was effective in achieving implementation of nurse-directed lavender aromatherapy to improve pain management experience in adult patients on a surgical-orthopedic unit of a community hospital. The surgical-orthopedic unit patient pain management experience percentile ranking increased from the 43rd percentile the quarter before implementation to the 78th percentile during the implementation period. The Lunch & Learn presentations and Rounding for Results sessions impacted the extent of lavender aromatherapy adoption evidenced by the surgical-orthopedic unit patients comprising 61% of all community hospital patients screened for aromatherapy and 33% of the hospital's lavender inhaler use. Use of a logic model guided successful implementation. The strategies of Lunch & Learn

presentations, Rounding for Results sessions, and nurse PC discussions were feasible. The implementation of the nurse PC strategies of unit-huddles and peer coaching identified in the nurse PC discussions was limited to four of seven hospital units. Adoption of the practice change was slower than anticipated and required additional rounds by the hospital CNS and nurse educators. Utilization of EMR aromatherapy documentation reports provided insight into lavender aromatherapy use for all inpatients. Rounding for Results observations provided insights for improvement of these EMR reports. The logic model methodology, interventions of Lunch & Learn presentations, Rounding for Results sessions, and nurse PC-directed unit huddles and peer coaching were suitable for implementation of future practice changes.

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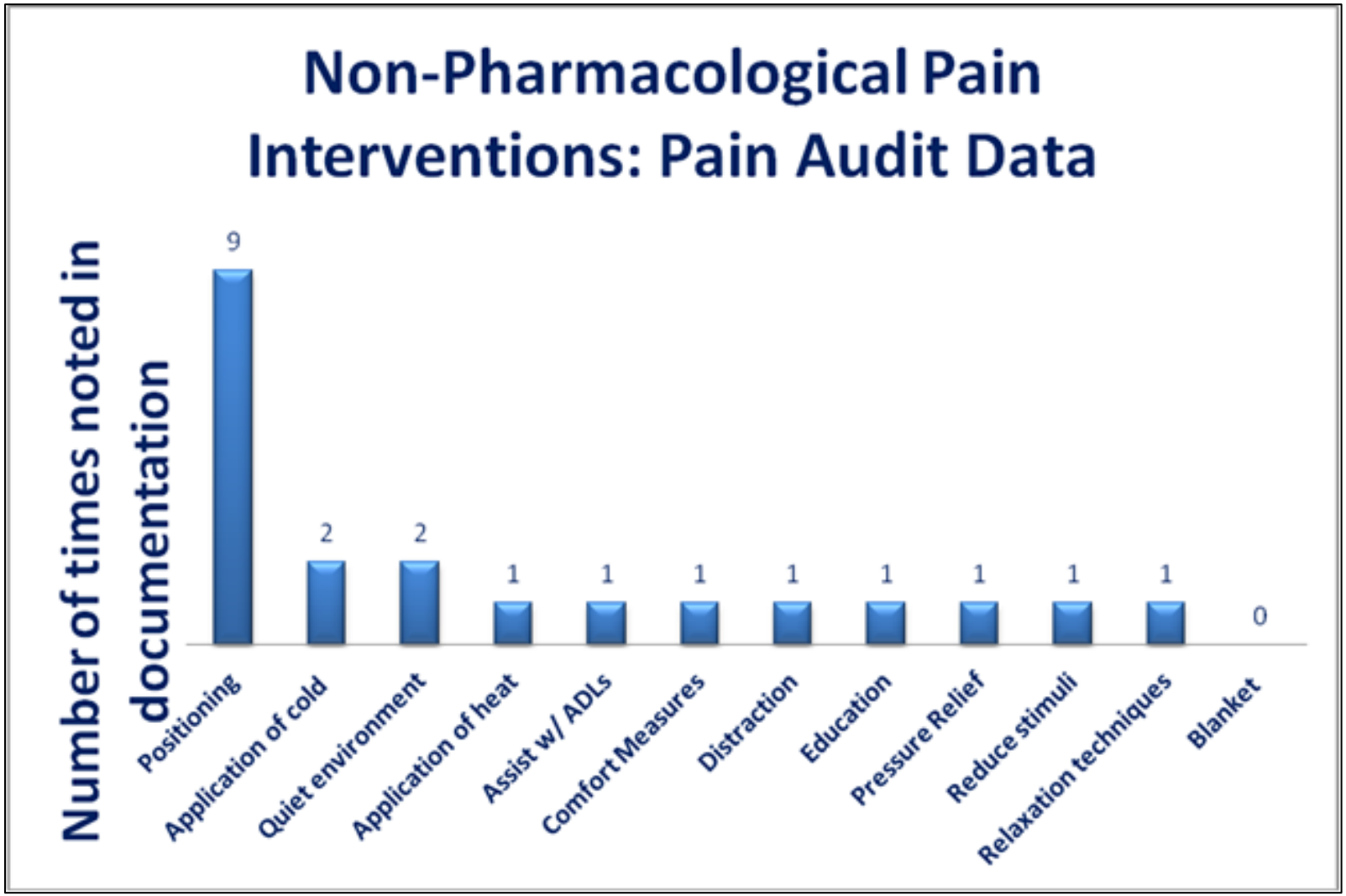
Appendix A

Non-Pharmacological Pain Management Intervention Frequency in an Audit of 65 Patient Records



Appendix B

Completed Project Plan for Health System Product Pilot of Lavender Aromatherapy

Process Steps	Dec. 2017	Jan. 2018	Feb. 2018	Mar. 2018	April 2018	May 2018	Jun. 2018	Jul. 2018	Aug. 2018	Sep. 2018	Oct. 2018	Nov. 2018
Legal Review												
Aromatherapy Product Approval												
Supply processes												
Patient and family education document												
Electronic medical record documentation												
Clinical Protocol including physician subject matter expert review.												
Aromatherapy education development for pilot												
Occupational Health Review												
Laundry Service Testing												
Pilot of product and process												

Appendix C

Health System Protocol for Lavender Aromatherapy for Pain Management

Definitions

- Clinical aromatherapy: the use of oils that come from plants to improve how individuals feel physically and emotionally with outcomes that are measurable. It is different than aesthetic aromatherapy that is the use of oils for enjoyment.
- Essential oils: plant derived oils that are extracted by distillation or extraction, which differs from fragrance oils that are synthetic and are often used in perfumes.
- Direct inhalation: delivery of the aroma of the essential oil via an impregnated carrier such as an inhaler located near the patient. Direct inhalation differs from diffusion in which the essential oil is dispersed through a room.

Target Population for Pain Management with Lavender Aromatherapy

- The target population for lavender aromatherapy is adult patients, ages 18 and older, experiencing acute or chronic pain or who have anticipated procedural pain. This includes patients in inpatient, observation, emergency department or procedural settings.
- Only patients who agree to use lavender aromatherapy should receive this intervention.
- Although this product may be safely used in pediatric patients above the age of five, the initial implementation will be limited to adults. Inclusion of pediatric patients may be considered after successful implementation in the adult population.

Product Selected by Health System Nursing Product Evaluation and Standardization Council (NPSEC)

- Plant Extracts Aethereo®Sticks: an inhaler that the patient can hold and lasts for up to several months

Indications

- Acute pain including post-operative pain and anticipated procedural pain.
- Chronic pain, particularly neck and back pain.

Contraindication

- Patient allergy or intolerance to the lavender plant or lavender essential oil.

Special Considerations

- Avoid use of lavender aromatherapy when the patient is in contact with children under the age of five. This includes post-partum mothers while in contact with the newborn. The Plant Extracts Aethereo®Sticks inhaler should be closed when children under the age of five are in the room.
- If visitors or associates who are in direct contact with the patient have intolerance to lavender aromatherapy, the Plant Extracts Aethereo®Sticks inhaler should be capped when those individuals are in the room.
- In a semi-private room, if the patient's roommate has intolerance to lavender aromatherapy, the Plant Extracts Aethereo®Sticks inhaler should be capped when the roommate is in the room.

Parameters for Lavender Aromatherapy

- Only nurses who have received education about lavender aromatherapy may administer it.
- A provider order is not required for lavender aromatherapy.
- Only direct inhalation via the Aethereo®Sticks inhaler will be used as the mode of delivery. Diffusion will not be considered.

Patient Assessment and Provision of Lavender Aromatherapy

- The nurse will ask the patient if he/she would like to use lavender aromatherapy and obtain patients' verbal agreement prior to initiating its use.
- The nurse may consider patients with decreased ability to smell for the intervention because these patients may still benefit from aromatherapy.
- The nurse will assess the patient for history of intolerance to the lavender plant or essential oil.
- In a semi-private room, the nurse will ask the patient's roommate if she/he has intolerance to lavender aromatherapy. If the roommate is intolerant, the nurse may use judgment to select one of these actions: (a) advise the patient that the Plant Extracts Aethereo®Sticks inhaler should be capped when the roommate is in the room; (b) make arrangements, if feasible, for a room change to allow the aromatherapy without capping; or (c) stop the aromatherapy assessment.
- The nurse will complete a pain assessment with a valid pain scale before and within 60 minutes after initiation of lavender aromatherapy.
- The nurse will review the patient and family education sheet for the product selected and instruct to the patient in a guided relaxation or deep breathing exercise during the initial use of the lavender aromatherapy. The education sheet may be printed from the aromatherapy assessment in MedConnect EMR system or from the StarPort intranet site.
    - The nurse will provide the aromatherapy with Aethereo®Sticks inhaler
        - Give the patient a lavender aromatherapy Aethereo®Sticks inhaler.
        - Instruct the patient to take off the top and hold it three or four inches from the nose and breathe in slowly.

- Assess the patient for any immediate intolerance to the Aethereo®Sticks inhaler.
- Instruct the patient to do this as needed, but no more than four times an hour.
- Instruct the patient to close the inhaler tightly after use.
- Instruct the patient that the inhaler must be closed when near children under five.
- Instruct the patient that the Aethereo®Sticks inhaler is intended for eternal use only. It is not to be placed in the mouth or nose.

Disposal

- The Aethereo®Sticks inhaler product should be capped and disposed of in a waste receptacle.

Documentation

The following elements should be documented in the electronic medical record:

- Presence or absence of lavender contraindication/reaction.
- Patient/family education provided.
- Verbal agreement obtained.
- Aromatherapy indication: acute pain, anticipated procedural pain, chronic pain.
- Aromatherapy product administered: Aethereo®Sticks Lavender Inhalation.
- Patient-reported aromatherapy frequency: More than once per hour, Once per hour, Every 2 hours, Every 4 hours, Every 6 hours, Every 8 hours, Every 12 hours, Less than every 12 hours.
- Pain assessment before and within 60 minutes after initiation of lavender aromatherapy.

Safety and Adverse Reactions

- Safety Information
    - Lavender aromatherapy is safe to use for most adult patients.[1]
    - There are no commonly reported side effects for direct inhalation of lavender essential oil.
    - Allina Health uses the Plant Extracts Aethereo®Sticks inhalers along with other products and reports no serious adverse events in over 60,000 aromatherapy applications in 13 hospitals and over 80 clinics and home care (J. Streeter, personal communication, May 24, 2018).
- Management of Patient Intolerance
    - If a patient develops intolerance to the lavender aromatherapy, such as a headache or nausea, the nurse caring for the patient will immediately remove and discard the lavender aromatherapy product. The product should be capped and disposed in a closed waste receptacle outside of the patient room, preferably the soiled utility room.
    - The nurse will notify the physician or advanced practice clinician of the intolerance and note it in the patient's electronic medical record.

[1] Not regulated by the U.S. Food & Drug Administration (FDA). The FDA has not evaluated this statement. Aromatherapy is not intended to diagnose, treat, cure or prevent disease.

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Appendix D

Patient and Family Aromatherapy Education Document

MedStar Health

Lavender Aromatherapy

To Help You Treat Your Pain

AethereoSticks Inhaler Instructions

What is Aromatherapy?
Clinical aromatherapy ("uh-ROH-muh-THERR-uh-pee") is the use of oils that come from plants to improve how you feel physically and emotionally. The smell of lavender can help you manage your pain. It can also help you if you are feeling anxious or having trouble sleeping because of your pain.

Is it Safe to Use Lavender Aromatherapy?
Lavender aromatherapy is safe to use for most adult patients.* It is made from the lavender plant. If the lavender plant has caused you to sneeze or have a rash or trouble breathing, do not use it. Do not take lavender by mouth or swallow it.

How does Aromatherapy Work?
Your nurse will give you a lavender aromatherapy inhaler. Take off the top and hold it three or four inches from your nose. Breathe in slowly. Do this as you need but no more than four times an hour. Close tightly after use and store at room temperature (59° to 77°F).

The lavender inhaler must be closed when you are near children under five or anyone who says the smell makes them sick.

How does Aromatherapy Fit in My Pain Treatment Plan?
Helping you treat your pain is very important to your care team. We want you to be part of making your pain treatment plan. Most patients use medicine together with other methods of pain control, like deep breathing and clinical aromatherapy. If you have any questions or concerns about clinical aromatherapy, please speak with a member of your care team.

*Not regulated by the U.S. Food & Drug Administration (FDA). The FDA has not evaluated this statement. Aromatherapy is not intended to diagnose, treat, cure or prevent disease.

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Appendix E

Nursing Education on Lavender Aromatherapy: PowerPoint Slides

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AethereoStick Lavender Aromatherapy:
A Non-Pharmacological Approach to Pain Management

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Objectives

- Discuss purpose, procedure, and nursing responsibility when using lavender aethereostick aromatherapy
- Describe nursing documentation required when using lavender aethereostick aromatherapy

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What is Lavender Aromatherapy?

- Non-pharmacological, intervention that uses lavender essential oil absorbed through the olfactory system
- Used to manage pain and improve physical and emotional well-being
- Lavender essential oil is derived from the lavandula angustifolia plant

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Therapeutic Intervention

Lavender aromatherapy is effective in managing symptoms of pain, anxiety and insomnia.

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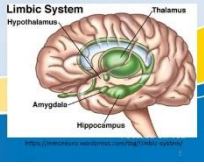
Clinical Aromatherapy for Pain Management

- Alters the **perception** at the sub-cortical and cortical pleasure memory centers of the brain.
- Has an effect on **neurotransmitter receptors** for dopamine, seratonin and noradrenaline.
- Works via the nasal route to the **limbic system** via olfactory bulb (or)
- Works via the **pulmonary route** with inhalation of volatile compounds

Buckle, 2015



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Evidence-Based Intervention

- Allina Health System Observational Study

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*, 64–169. doi:10.1016/j.ctim.2016.03.006

- Meta- Analysis of 11 Aromatherapy Studies

Lakhan, S. E., Sheafer, H., & Tepper, D. (2016). The effectiveness of aromatherapy in reducing pain: A systematic review and meta-analysis. *Pain Research and Treatment*, *2016*(8158693), 1-13. doi:10.1155/2016/8158693

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Lavender AethereoSticks

- Acute pain
  - Post-operative pain
- Anticipated procedural pain
- Acute and chronic pain
- Chronic pain (i.e. neck and back)

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Lavender AethereoSticks

- Nurse driven protocol- physician order not required
- Only RNs who have received training may administer
- Single patient personal inhalation therapy
- Only direct inhalation via Aethereostick inhaler is permitted. Room diffusion is not allowed

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Target Population

- Adult patients (over 18 years) who are able to provide verbal agreement for aromatherapy
- Do not use around children under 5 (keep cap securely closed)
- Avoid in patients with intolerance to lavender

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Inhalation Etiquette

- If the patient's roommate is intolerant to lavender
  - Advise patient using Lavender inhaler to keep inhaler capped when roommate is in the room
  - If feasible, make arrangements for a room change
  - If capping inhaler is not adequate, discontinue aromatherapy

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AethereoSticks Lavender Safety

- External aromatic use only
- Patient verbal agreement must be obtained prior to use
- Report adverse reactions/intolerances
- Store in medication room or secure environment

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Patient Directions for Use

- Unscrew the top and hold the inhaler three or four inches from your nose
- Breathe in slowly. Repeat no more than four times an hour
- Close tightly after use
- Store at room temperature

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Expiration

- Lavender inhalers expire 3 months after opening
- Discard unopened inhalers if 12 months past date on inhaler
- Dispose of inhaler in waste receptacle

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Regulations and Responsibilities

- Neither Maryland nor DC regulate aromatherapy
- RN responsibility:
  - Complete aromatherapy education prior to use
  - Inform patients about aromatherapy and its role in their overall treatment plan and goals
  - Inform patient that aromatherapy is not licensed by states or regulated by the FDA
  - Obtain verbal agreement
  - Document pain score upon initiation and 1 hour post-intervention

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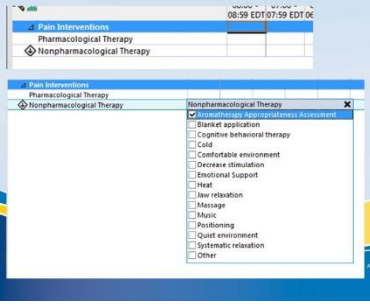
Medconnect Documentation



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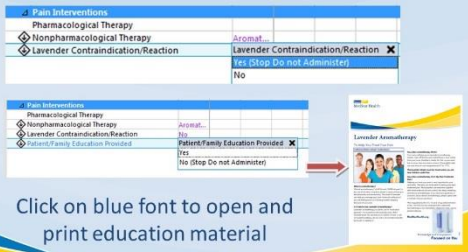

Click on blue font to open and print education material

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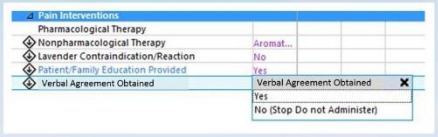

After completing documentation, a one time task will fire for one hour pain reassessment. Clicking on the task will take you to the pain assessment in iView.

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QUIZ

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Question

- Aromatherapy can be administered by all healthcare professionals?
- False, only registered nurses who have completed education on aromatherapy may administer it

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Question

- Lavender aromatherapy is a nurse driven protocol.
- True, lavender aromatherapy is a nurse driven protocol and does not require a physician order

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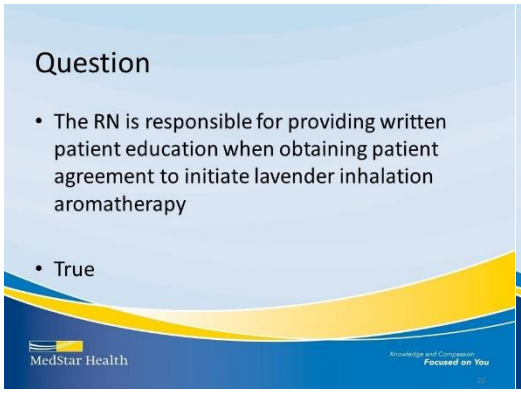
Question
• The RN is responsible for providing written patient education when obtaining patient agreement to initiate lavender inhalation aromatherapy
• True
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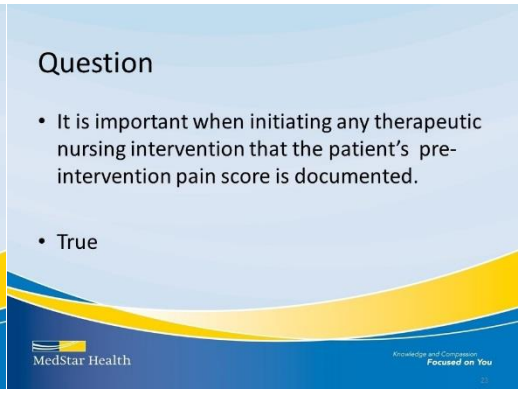
Question
• It is important when initiating any therapeutic nursing intervention that the patient's pre-intervention pain score is documented.
• True
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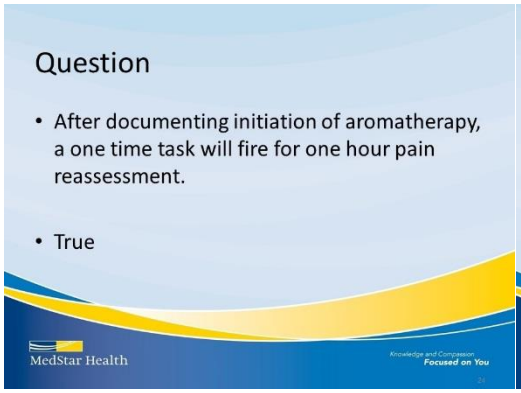
Question
• After documenting initiation of aromatherapy, a one time task will fire for one hour pain reassessment.
• True
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Appendix F

Lavender Aromatherapy Directions for Clinical Nurses

Patients with acute or chronic pain may be candidates for aromatherapy.

Product Name: Aethereo®Sticks Lavender Aromatherapy

Inform patients about aromatherapy and its role in their overall treatment plan and goals.

Inform patient that aromatherapy is not licensed by states or regulated by the FDA.

Give Lavender Aromatherapy patent education sheet to the patient.

Document lavender contraindications that patient or family provide. Do not administer.

Obtain patient verbal agreement if no contraindications.

Ascertain roommate intolerance to lavender direct accordingly (capping or room change).

Perform initial pain assessment upon initiation and document in MedConnect.

Patient Directions

- Unscrew the top and hold the inhaler three or four inches from your nose.
- Breathe in slowly. Repeat no more than four times an hour
- Close tightly after use.
- Store at room temperature.

Reassess and document pain score one hour after use of lavender inhalation.

If a patient develops intolerance to the lavender aromatherapy, such as a headache or nausea, the nurse caring for the patient will immediately remove and discard the lavender aromatherapy product. The product should be capped and disposed in a closed waste receptacle outside of the patient room, preferably the soiled utility room.

Appendix G

Nurse-Directed Lavender Administration for Pain Management:

An Overview for Physicians and Advanced Practice Clinicians

Situation: Nurses will begin offering adult patients experiencing pain lavender aromatherapy by nasal inhalation, beginning Fall 2018.

Background Information regarding Nurse-directed Lavender Aromatherapy:

- Registered nurses will offer lavender aromatherapy nasal inhalers to adult patients experiencing pain. The inhaler contains a high-quality lavender essential oil.
- A physician or advanced practice clinician (APC) order will not be required.
- The nurse will assess the patient for intolerance to lavender then ask if the patient wants to use lavender aromatherapy. The patient will be instructed to hold the inhaler under the nose and take deep breaths to inhale the lavender aroma, up to four times an hour as needed. Nurses will document use in. In semi-private rooms, nurses will also assess roommates for intolerance before use can begin.
- Lavender should not be used near children under 5 years of age. Patients will be instructed to cap the inhaler while children or others who may be intolerant are nearby.
- There is moderate level of evidence that lavender inhalation improves acute pain management.
    - Randomized controlled clinical trials demonstrated statistically significant decreases in pain scores in the lavender inhalation group as compared to the controlled group (Bagheri-Nesami, Espahbodi, Nikkhah, Shorofi, & Charati, 2014; Heidari Gorji et al., 2015; Irmak Sapmaz et al., 2015; Karaman et al., 2016; Kim et al., 2007). Kim et al.

(2006) demonstrated statistically better patient satisfaction with pain management despite no statistically significant decreases in pain.

  - Kim et al. (2007) reported patients who inhaled lavender had statistically less opioid use than the control group (Kim et al., 2007).
  - Johnson et al. (2016) reported a mean decrease of 3 points on a 0-10 pain scale.

- Patients in most of the health system hospitals have not reported satisfaction with pain management at the desired benchmark. Lavender aromatherapy is a nonpharmacological pain management intervention that aligns with Joint Commission standards.
- Lavender inhalation is safe for most patients to use.[2]
  - Essential oils do not contain proteins that are associated with Type I hypersensitivity reactions. Like any other compound, it is possible for patients to develop IgG antibodies with exposure (J. Baraniuk, personal communication, May 23, 2018). However, this has not been commonly reported (Buckle, 2015). Use has not been associated with clinical worsening of asthma (Buckle, 2015).
  - Seven clinical trials reported no serious patient events (Bagheri-Nesami, Espahbodi, Nikkhah, Shorofi, & Charati, 2014; Heidari Gorji et al., 2015; Irmak Sapmaz et al., 2015; Johnson et al., 2016; Karaman et al., 2016; Kim et al., 2006; Kim et al., 2007).
  - Two health systems, Allina Health and New York Presbyterian, reported no serious patient or associate safety events with use in multiple hospitals over multiple years (Joswiak et al., 2016; J. Seley, personal communication, May 30, 2018).

[2] Not regulated by the U.S. Food & Drug Administration (FDA). The FDA has not evaluated this statement. Aromatherapy is not intended to diagnose, treat, cure or prevent disease.

Assessment: Nurse-directed lavender inhalation aromatherapy will be offered to patients experiencing pain.

Request: Physicians and APCs become informed about this intervention. Physicians or APCs discuss concerns regarding use in specific patients with the clinical nurse caring for the patient. For additional information contact: Karen Mack, MS, MBA, APRN, CCNS, ACNP-BC, Clinical Practice Program Specialist, System Nursing.

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Appendix H

Supply Chain Launch Brief

CONFIDENTIAL

Supply Chain Contract Launch Brief

Plant Extracts International – Aethereo Lavender Stick

Contract: XXXX
Effective Dates: XX/XX/XX - XX/XX/XX

PSID	Catalog #	Item Description	UOM	Quantity per UOM	UOM Price	Each Price
XXXXX	XXX	Lavender Aethereo Stick	Each	1	$XXX	$X.XX

Providing with the following Annual Savings:
No cost savings identified with this initiative, used in conjunction for pain management therapy.

Additional Action Items:

- Product only available through Plant Extracts International direct at this time
- Additional product information attached:

Vendor Resources: Plant Extracts International

Jill Rivard
Sales Representative
Email: jill@plantextractsinc.com
Mobile: 952-935-2075

Resources:

Please contact your local facility Supply Chain Team for logistical questions.

Please direct any questions concerning this agreement to Corporate Supply Chain.

Appendix I

Aromatherapy Lunch & Learn Presentation Objectives and Agenda

Learning outcomes:

At the end of the Lunch & Learn session clinical nurses will:

1. State the indications for aromatherapy.
2. Identify the key steps in the aromatherapy appropriateness assessment.
3. Explain how patients should use the lavender inhalers.
4. Describe actions to take if a patient develops an intolerance to the lavender inhaler.

Agenda:

1. Introduction (5 minutes)

Note: These questions will reinforce content provided in the aromatherapy computer-based module that some participants nurses will likely have completed before the session.

Using a multiple-choice question and answer group participation session, clinical nurses will answer the following questions:

a. What is lavender aromatherapy?

i. A new paint color to enhance moods.

ii. Non-pharmacological, intervention that uses lavender essential oil absorbed through the olfactory system used to manage pain and improve physical and emotional well-being.

iii. A new product to improve the smell of the hospital linen.

Answer ii is correct.

b. Which of the following does not a mechanism of action of lavender aromatherapy?

   i. Alters the perception at the sub-cortical and cortical pleasure memory centers of the brain.

   ii. Works via the nasal route to the limbic system via olfactory bulb or via the pulmonary route with inhalation of volatile compounds.

   iii. Causes the release cortisol.

   Answer iii is correct. It does not cause the release of cortisol but does affect neurotransmitter receptors for dopamine, seratonin and noradrenaline.

c. True or false: Lavender aromatherapy requires a physician or advanced practice provider order.

   Answer “false” is correct. It is a nurse-directed intervention that requires assessment of patient intolerance

d. The target population for lavender aromatherapy is:

   i. All patients having acute or chronic pain or may be having painful procedures.

   ii. Only patients 18 and older having acute or chronic pain or may be having painful procedures.

   iii. All patients because it may be helpful for sleep or anxiety.

   Answer ii is correct. Although lavender is helpful for sleep and anxiety, the hospital policy limits use to those patients 18 and older who are having pain.

e. When do the lavender inhalers expire?

i. Seven days after opening.

ii. Twenty-four hours day after opening.

iii. Twelve months after opening.

iv. Three months after opening.

Answer iv is correct: Three months after opening. Discard any unopened inhaler that is more than 12 months old.

2. Present content by reviewing two aromatherapy documents (5 minutes)

a. Lavender Aromatherapy Directions for Clinical Nurses. See Appendix F.

b. Aromatherapy Patient and Family Education document. See Appendix D.

3. Learning assessment: (3 minutes)

Using a group participation session, clinical nurses will answer the following questions:

a. What are key points to highlight in educating patients?

i. It can help patients manage pain, but it is not FDA regulated to treat pain.

ii. To hold the inhaler three to four inches from the nose and breathe in slowly.

iii. Close the inhaler when near children under 5 or anyone who says the smell makes them sick.

b. Who can provide it to patients?

i. Only registered nurses who have completed the computer-based module.

c. What are the contraindications to lavender aromatherapy?

i. Any patient-reported allergy or intolerance to lavender essential oil.

d. What must a patient do before you provide the inhaler?

i. Verbally agree to use it.

e. How long after the first lavender use do you reassess the patient's pain intensity?

i. Approximately one hour

4. Question and answer session (2 minutes)

Appendix J

Nurse Pain Champion Meeting Aromatherapy Discussions

The nurse pain champions will:

- Identify nurse champion role domains that align with aromatherapy implementation.
- Discuss aromatherapy indications, contraindications, patient education
- Describe the four stages of the Iowa model of evidence-based practice (EBP) and how each relates to aromatherapy implementation using the Hospital Aromatherapy Implementation Action Plan. See Appendix P.
- Determine two Iowa model EBP actions each nurse PC will take to foster implementation of aromatherapy on her/his nursing unit.
- Review aromatherapy supply chain and electronic medical record report data at each meeting.
- Identify implementation successes, barriers, best practice and barrier solutions.

<u>Meeting 1 Agenda</u> (30 minutes)

- Review:
  - Lavender Aromatherapy Directions for Clinical Nurses. See Appendix F.
  - Aromatherapy Patient and Family Education document. See Appendix D.
- Review the Iowa model of EBP dissemination stages and strategies. See Appendix M.
- Review the Hospital Aromatherapy Implementation Action Plan Iowa model strategies. See Appendix P.
- Discuss what Iowa model strategies will be effective options the can implement for aromatherapy implementation and select two.

- Develop two specific, measurable, attainable, relevant, time-bound SMART goals for aromatherapy to foster aromatherapy implementation with an action that each nurse PC will take in the next 30 days.
- Review aromatherapy supply chain and electronic medical record report data.

Meeting 2 Agenda (30 minutes)

- Discuss the successes and any barriers noted regarding aromatherapy implementation on her/his unit.
- Identify best practices and solution barriers from the discussion.
- Report the two Iowa model EBP actions each nurse PC took to foster implementation of aromatherapy on her/his nursing unit.
- Review aromatherapy supply chain and electronic medical record report data.
    - Discuss two actions each nurse PC will take to foster aromatherapy implementation in the next 30 days. This may include follow-up on pervious SMART goals or development of new SMART goals.

Appendix K

DNP Student Surgical-Orthopedic Unit Rounding for Results Form

Week _____Date_____
Nurse leader validates mentioning aromatherapy on leader rounds ☐Yes ☐No
Aromatherapy par levels adequate ☐Yes ☐No
Nurses who provide verbal intent to offer lavender: _____
Number of nurses interviewed on rounds: _____

Case	Lavender aromatherapy contraindication screening documented.	Lavender aromatherapy education documented if no contraindication.	Lavender aromatherapy offer documented if no contraindication and education complete.	Patient demonstrates correct use of lavender inhaler.	Barriers, facilitators and comments.
1	□Yes □No □N/A*	□Yes □No □N/A**	□Yes □No □N/A**	□Yes □No □N/A***	
2	□Yes □No □N/A*	□Yes □No □N/A**	□Yes □No □N/A**	□Yes □No □N/A***	
3	□Yes □No □N/A*	□Yes □No □N/A**	□Yes □No □N/A**	□Yes □No □N/A***	
4	□Yes □No □N/A*	□Yes □No □N/A**	□Yes □No □N/A**	□Yes □No □N/A***	
5	□Yes □No □N/A*	□Yes □No □N/A**	□Yes □No □N/A**	□Yes □No □N/A***	
6	□Yes □No □N/A*	□Yes □No □N/A**	□Yes □No □N/A**	□Yes □No □N/A***	
7	□Yes □No □N/A*	□Yes □No □N/A**	□Yes □No □N/A**	□Yes □No □N/A***	
8	□Yes □No □N/A*	□Yes □No □N/A**	□Yes □No □N/A**	□Yes □No □N/A***	
9	□Yes □No □N/A*	□Yes □No □N/A**	□Yes □No □N/A**	□Yes □No □N/A***	
10	□Yes □No □N/A*	□Yes □No □N/A**	□Yes □No □N/A**	□Yes □No □N/A***	
11	□Yes □No □N/A*	□Yes □No □N/A**	□Yes □No □N/A**	□Yes □No □N/A***	
12	□Yes □No □N/A*	□Yes □No □N/A**	□Yes □No □N/A**	□Yes □No □N/A***	
13	□Yes □No □N/A*	□Yes □No □N/A**	□Yes □No □N/A**	□Yes □No □N/A***	
14	□Yes □No □N/A*	□Yes □No □N/A**	□Yes □No □N/A**	□Yes □No □N/A***	
15	□Yes □No □N/A*	□Yes □No □N/A**	□Yes □No □N/A**	□Yes □No □N/A***	

* Pain is not present or anticipated and/or patient is excluded due to cognitive impairment, pregnancy, or prisoner status.
** Contraindication to lavender present.
*** Contraindication to lavender present or patient declined.

Appendix L

Literature Review of Aromatherapy Experimental Trials with Lavender Aromatherapy as a Pain Management Intervention

Citation	**Research Question**	**Study Design**	**Independent Variable(s)**	**Dependent Variable (or Outcome)**	**Sample size**	**Results**
Bagheri-Nesami (2014)	In a population of end-stage renal disease patients undergoing hemodialysis via needle cannulation of the access site, is aromatherapy with lavender as compared to placebo	The study was a randomized controlled clinical trial with an experimental group (AT) and a control group (CG).	Aromatherapy with lavender diluted with sweet almond oil as compared to sweet almond oil alone described as placebo.	Self-reported pain using the Visual Analog Scale	Both the experimental and control groups were comprised of 46 patients each.	A statistically significant difference between the AT and the CG after three sessions ($p < .009$). Both groups also had a significantly decreased pain score after three treatments as compared with

Citation	Research Question	Study Design	Independent Variable(s)	Dependent Variable (or Outcome)	Sample size	Results
	associated with decreased reported pain?					baseline ($p < .001$ in both groups).
Heidari Gorji (2015)	In a population of patients who have undergone cardiac surgery with sternotomy, is aromatherapy with lavender with supplemental oxygen as compared to supplemental	The study was a randomized controlled clinical trial with an experimental group (AT) and a control group (CG).	Aromatherapy with lavender and supplemental oxygen as compared to supplemental oxygen alone	Self-reported pain using the Visual Analog Scale	Both the experimental and control groups were comprised of 25 patients each.	A statistically significant difference between the AT and the CG was noted at five, 30, and 60-minute intervals post intervention as compared to the CG who received supplemental oxygen alone ($p <$

Citation	Research Question	Study Design	Independent Variable(s)	Dependent Variable (or Outcome)	Sample size	Results
	oxygen alone associated with decreased reported pain?					.001, p < .002, p < .001 respectively).
Irmak Sapmaz (2015)	In a population of patients with renal colic is aromatherapy with lavender and conventional care as compared to conventional care alone associated with	The study was a double blinded placebo controlled clinical trial with an experimental group (AT) and a control group (CG). Randomization was described but did not meet Jadad	Aromatherapy with lavender as compared to normal saline placebo	Self-reported pain using the Visual Analog Scale	Both the experimental and control groups were comprised of 50 patients each.	A statistically significant difference between the AT and the CG was noted at 30 minutes but not at 10 minutes post intervention as compared to the CG who received placebo (p =.022 at

Citation	Research Question	Study Design	Independent Variable(s)	Dependent Variable (or Outcome)	Sample size	Results
	decreased reported pain?	or McMaster criteria for randomization (Effective Public Health Practice Project, 1998; Jadad et al., 1996).				30 minutes, p = .152 at 10 minutes).
Karaman (2016)	In a population of patients undergoing peripheral venous cannulation (PVC) for	The study was a randomized controlled single-blinded study with an experimental group (AT) and a	Aromatherapy with lavender as compared to water placebo	Self-reported pain and anxiety using the Visual Analog Scale as well as a patient satisfaction Likert scale.	Both the experimental and control groups were comprised of 53 patients each initially	There was a statistically significant difference in self-reported pain and anxiety in the AT group as compared

Citation	Research Question	Study Design	Independent Variable(s)	Dependent Variable (or Outcome)	Sample size	Results
	outpatient surgery, is aromatherapy with lavender and as compared to water associated with decreased reported PVC pain, anxiety and higher patient satisfaction?	control group (CG).			and due to drop-out for protocol issues, 51 were included in intervention and 50 in experimental group analysis.	to the control group ($p < .01$ and $p < .001$ respectively). There was a statistically significant higher patient satisfaction scores in the AT group as compared to the CG group ($p < .003$).
Kim (2006)	In a population of patients who have undergone	The study was a randomized controlled trial	Aromatherapy with lavender and	Self-reported pain using the Numeric Rating Scale and	Both the experimental and control	Self-reported pain and opioid analgesic use did not vary

Citation	Research Question	Study Design	Independent Variable(s)	Dependent Variable (or Outcome)	Sample size	Results
	breast biopsy surgery, is aromatherapy with lavender with supplemental oxygen as compared to supplemental oxygen alone associated with decreased reported pain, decreased opioid analgesic use	without blinding with an experimental group (AT) and a control group (CG). All enrolled patients received skin sensitivity tests prior to surgery as stipulated by the institutional review board.	supplemental oxygen as compared to supplemental oxygen alone	total number of oxycodone acetaminophen tablets administered.	groups were comprised of 25 patients each.	significantly between the AT group and CG group and no p values were reported for either of these variables. Pain control satisfaction was statistically significant for higher scores in the AT group as compared to the CG group ($p < .05$).

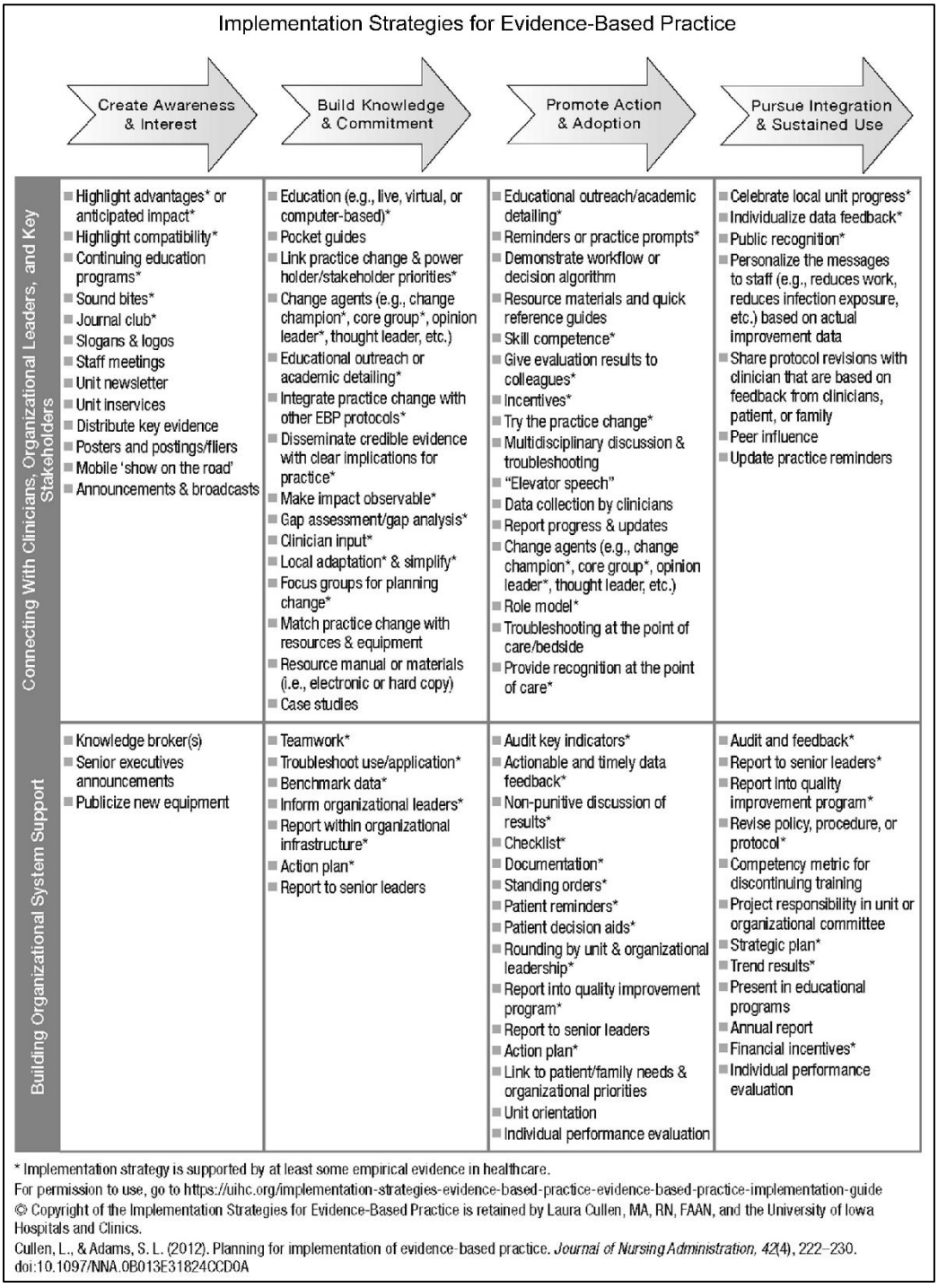
Citation	Research Question	Study Design	Independent Variable(s)	Dependent Variable (or Outcome)	Sample size	Results
	and/or higher patient pain management satisfaction?					
Kim (2007)	In a population of patients who have undergone laparoscopic adjustable gastric banding (LAGB) surgery, is aromatherapy with lavender with supplemental	The study was a randomized controlled clinical trial with an experimental group (AT) and a control group (CG). All enrolled patients received skin sensitivity tests prior to	Aromatherapy with lavender and supplemental oxygen as compared to supplemental oxygen with unscented baby oil	Primary outcome: total opioid analgesics administered. Secondary outcomes: Self-reported pain with a Numeric Rating Scale, sedation with the Observer's assessment of	Both the experimental and control groups were comprised of 27 patients each initially and there was one drop-out for a protocol	There was a statistically significant difference of lower opioid use amount and numbers of patients requiring opioids in the AT group as compared to the CG group ($p < .04$ and $p < .007$

Citation	Research Question	Study Design	Independent Variable(s)	Dependent Variable (or Outcome)	Sample size	Results
	oxygen as compared to non-scented baby oil supplemental oxygen associated with decreased opioid analgesic use?	surgery as stipulated by the institutional review board.		Alertness/Sedation (OAA/S) scale, administration of anti-hypertensives or anti-emetics, and recovery unit length of stay in minutes.	issues in the AT group.	respectively). Body mass index and weight were significantly lower in the AT group ($p < .05$ for both). The AT groups sedation at discharge from the recovery unit was significantly lower than the control group ($p<.05$). There were no statistically significant

Citation	Research Question	Study Design	Independent Variable(s)	Dependent Variable (or Outcome)	Sample size	Results
						differences between the two groups in self-reported pain, antiemetic or antihypertensive administration, or time spent in the recovery unit.

Appendix M

Iowa Model Implementation Strategies



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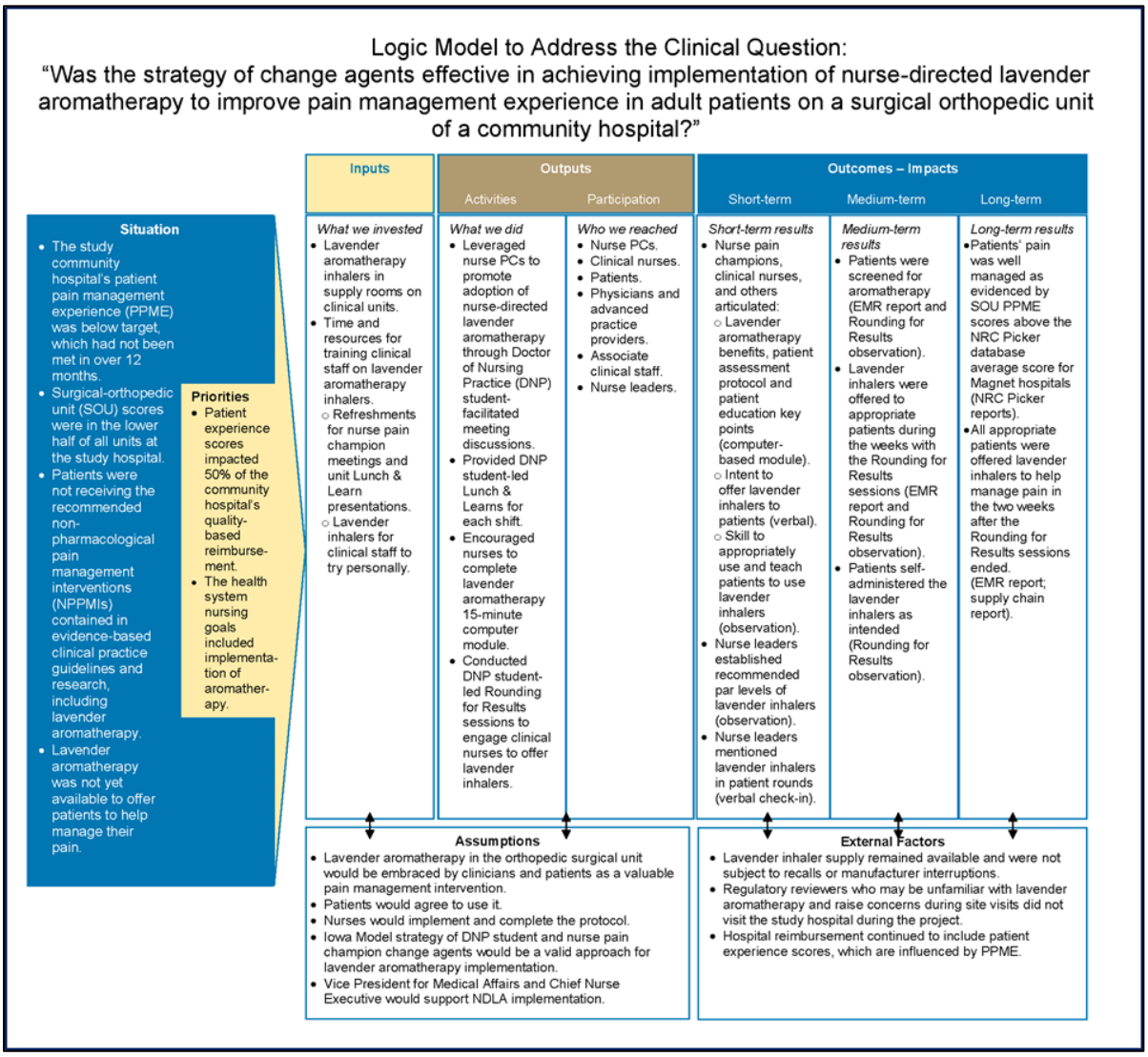
Appendix N

Aromatherapy Logic Model



Appendix O

Weekly EMR System Aromatherapy Documentation Reports

- Percent of patients with lavender aromatherapy contraindication screening documented.
    - Numerator: Number of adult (age 18 or older) surgical-orthopedic unit patients with Lavender Contraindication/Reaction field documented as “Yes” or “No.”
    - Denominator: Number of adult (age 18 or older) surgical-orthopedic unit patients.
- Percent of screened patients with lavender aromatherapy contraindication documented as “Yes.”
    - Numerator: Number of adult (age 18 or older) surgical-orthopedic unit patients with Lavender Contraindication/Reaction field documented as “Yes.”
    - Denominator: Number of adult (age 18 or older) surgical-orthopedic unit patients with Lavender Contraindication/Reaction field documented as “Yes” or “No.”
- Percent of screened patients with lavender aromatherapy contraindication documented as “No” and lavender aromatherapy inhaler offer documented as “Yes” or “No.”
    - Numerator: Number of adult (age 18 or older) surgical-orthopedic unit patients with Lavender Contraindication/Reaction field documented as “No” and the Verbal Agreement field documented as “Yes” or “No.”
    - Denominator: Number of adult (age 18 or older) surgical-orthopedic unit patients with Lavender Contraindication/Reaction field documented as “No.”
- Percent of screened patients with lavender aromatherapy contraindication documented as “No” and lavender aromatherapy inhaler offer documented as “Yes.”

- Numerator: Number of adult (age 18 or older) surgical-orthopedic unit patients with Lavender Contraindication/Reaction field documented as “No” and the Verbal Agreement field documented as “Yes.”
- Denominator: Number of adult (age 18 or older) surgical-orthopedic unit patients with Lavender Contraindication/Reaction field documented as “No.”

Appendix P

Community Hospital Aromatherapy Implementation Action Plan

Tactic	Iowa Model Stages and Levels	Implementation timeline
1. Encouragement of nurses to complete an aromatherapy computer-based training module during the following interactions: nurse PC meetings, Lunch & Learn presentations, and Rounding for Results sessions.	Interest & Awareness Knowledge & Commitment Key Stakeholder Level	By the end of the fourth week of DNP student Rounding for Results sessions.
2. Two nurse PC meeting discussions about how to promote aromatherapy in the practice setting.	Interest & Awareness. Knowledge & Commitment, Action & Adoption; Integration & Sustainment Key Stakeholder Level, Organizational Level	By the end of quarter three FY 2019.
3. Three Lunch & Learn aromatherapy presentations for surgical-orthopedic unit clinical nurses.	Interest & Awareness Knowledge & Commitment Key Stakeholder Level	By the end of the fourth week of DNP student Rounding for Results sessions.
4. Four DNP Rounding for Results sessions with clinical nurses on the surgical-orthopedic unit.	Interest & Awareness, Knowledge & Commitment, Action & Adoption; Key Stakeholder Level	By the end of quarter three FY 2019.
5. Development of reports including supply chain monthly lavender inhaler usage and EMR aromatherapy documentation report for nurse PCs to review at their meetings.	Action & Adoption; Integration & Sustainment Organizational level	By the end of the third quarter of FY 2019.

Appendix Q

Aromatherapy Project Results Excel Workbook

Worksheet 1

Rounding Contextual Data All

Contextual Question	Week 1	Week 2	Week 3	Week 4	Descriptive Statistics
Nurse leader validates mentioning aromatherapy on leader rounds (YES, NO)					#DIV/0!
Aromatherapy par levels adequate (YES, NO)					#DIV/0!
Nurses who provide verbal intent to offer lavender					#VALUE!
Number of nurses interviewed on rounds					#DIV/0!
Percent of Nurses who provide verbal intent to offer lavender	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

Worksheet 2

Rounding Pt Data Week 1

Case	Lavender aromatherapy contraindication screening documented. (YES, NO, N/A*)	Lavender aromatherapy education documented if no contraindication. (YES, NO , N/A**)	Lavender aromatherapy offer documented if no contraindication and education complete. (YES, NO , N/A**)	Patient demonstrates correct use of lavender inhaler. (YES, NO, N/A***)	Barriers	Barrier Category (Patient, Nurse, Environment, Other)	Facilitators	Facilitator Category (Patient, Nurse, Environment, Other)	Comments	Facilitator Category (Patient, Nurse, DNP Student , Other)

Worksheet 3

Rounding Pt Data Week 2

Case	Lavender aromatherapy contraindication screening documented. (YES, NO, N/A*)	Lavender aromatherapy education documented if no contraindication. (YES, NO , N/A**)	Lavender aromatherapy offer documented if no contraindication and education complete. (YES, NO , N/A**)	Patient demonstrates correct use of lavender inhaler. (YES, NO, N/A***)	Barriers	Barrier Category (Patient, Nurse, Environment, Other)	Facilitators	Facilitator Category (Patient, Nurse, Environment, Other)	Comments	Facilitator Category (Patient, Nurse, DNP Student , Other)
0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!						

* Pain is not present or anticipated and/or patient is excluded due to cognitive impairment, pregnancy, non-English speaker, or prisoner status.
** Contraindication to lavender present.
*** Contraindication to lavender present or patient declined.

Worksheet 4

Rounding Pt Data Week 3

Case	Lavender aromatherapy contraindication screening documented. (YES, NO, N/A*)	Lavender aromatherapy education documented if no contraindication. (YES, NO , N/A**)	Lavender aromatherapy offer documented if no contraindication and education complete. (YES, NO , N/A**)	Patient demonstrates correct use of lavender inhaler. (YES, NO, N/A***)	Barriers	Barrier Category (Patient, Nurse, Environment, Other)	Facilitators	Facilitator Category (Patient, Nurse, Environment, Other)	Comments	Facilitator Category (Patient, Nurse, DNP Student , Other)
0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!						

* Pain is not present or anticipated and/or patient is excluded due to cognitive impairment, pregnancy, non-English speaker, or prisoner status.
** Contraindication to lavender present.
*** Contraindication to lavender present or patient declined.

Worksheet 5

Rounding Pt Data Week 4

Case	Lavender aromatherapy contraindication screening documented. (YES, NO, N/A*)	Lavender aromatherapy education documented if no contraindication. (YES, NO , N/A**)	Lavender aromatherapy offer documented if no contraindication and education complete. (YES, NO , N/A**)	Patient demonstrates correct use of lavender inhaler. (YES, NO, N/A***)	Barriers	Barrier Category (Patient, Nurse, Environment, Other)	Facilitators	Facilitator Category (Patient, Nurse, Environment, Other)	Comments	Facilitator Category (Patient, Nurse, DNP Student , Other)
0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!						

* Pain is not present or anticipated and/or patient is excluded due to cognitive impairment, pregnancy, non-English speaker, or prisoner status.
** Contraindication to lavender present.
*** Contraindication to lavender present or patient declined.

Worksheet 6

Rounding All Quant

Measure		Week 1	Week 2	Week 3	Week 4	Total
Lavender aromatherapy contraindication screening documented.	Yes					
	No					
	N/A					
	%					
Lavender aromatherapy education documented if no contraindication.	Yes					
	No					
	N/A					
	%					
Lavender aromatherapy offer documented if no contraindication and education complete.	Yes					
	No					
	N/A					
	%					
Patient demonstrates correct use of lavender inhaler.	Yes					
	No					
	N/A					
	%					

Worksheet 7

Rounding All Qual

Measure		Week 1	Week 2	Week 3	Week 4	Total
Barriers	Patient					
	Nurse					
	Environment					
	Other					
Facilitators	Patient					
	Nurse					
	Environment					
	Other					
Comments	Patient					
	Nurse					
	DNP Student					
	Other					

Worksheet 8

EMR Data

Measure	Data Descriptors	Week 1	Week 2	Week 3	Week 4	Total
Percent of patients with lavender aromatherapy contraindication screening documented.	Numerator: Number of adult (age 18 or older) orthopedic surgical unit patients with Lavender Contraindication/Reaction field documented as "Yes" or "No."					
	Denominator: Number of adult (age 18 or older) orthopedic surgical unit patients.					
	Percent					
Percent of screened patients with lavender aromatherapy contraindication documented as "Yes."	Numerator: Number of adult (age 18 or older) orthopedic surgical unit patients with Lavender Contraindication/Reaction field documented as "Yes."					
	Denominator: Number of adult (age 18 or older) orthopedic surgical unit patients with Lavender Contraindication/Reaction field documented as "Yes" or "No."					
	Percent					
Percent of screened patients with lavender aromatherapy contraindication documented as "No" and lavender aromatherapy inhaler offer documented as "Yes" or "No."	Numerator: Number of adult (age 18 or older) orthopedic surgical unit patients with Lavender Contraindication/Reaction field documented as "No" and the Verbal Agreement field documented as "Yes" or "No."					
	Denominator: Number of adult (age 18 or older) orthopedic surgical unit patients with Lavender Contraindication/Reaction field documented as "No."					
	Percent					
Percent of screened patients with lavender aromatherapy contraindication documented as "No" and lavender aromatherapy inhaler offer documented as "Yes."	Numerator: Number of adult (age 18 or older) orthopedic surgical unit patients with Lavender Contraindication/Reaction field documented as "No" and the Verbal Agreement field documented as "Yes."					
	Denominator: Number of adult (age 18 or older) orthopedic surgical unit patients with Lavender Contraindication/Reaction field documented as "No."					
	Percent					

Worksheet 9

Supply Chain Report

Month	Inhaler Consumption
February 2019	
March 2019	
April 2019	

Appendix R

Data Analysis Plan for Project Primary Clinical Question "Was the strategy of change agents effective in achieving implementation of nurse-directed lavender aromatherapy to improve pain management experience in adult patients on a surgical-orthopedic unit of a community hospital?"						
Variable Type	Measure Description	Data Source	Population	Measure Formula	Level of Measurement	Data Analysis Plan
Intervention (Independent)	Bundle of three change agent strategies (See below)	(See below)	(See below)	Bundle: Complete/ Not Complete Strategy Sessions held by type	Nominal for the Bundle Ratio	Report bundle was met. Values only
	<u>Strategy #1</u> Three DNP Student-led Lunch & Learns	Lunch & Learn Excel worksheet	Adult* surgical-orthopedic unit nurses and nursing associates	1. Number of attendees per session and total 2. Number of attendees by role at all three sessions combined	1. Ratio 2. Ratio	1. Mean, Range 2. Range among roles
	<u>Strategy #2</u> Four DNP student-led weekly Rounding for Results sessions	Rounding for Results Excel worksheet	Adult* surgical-orthopedic unit patients	Number of patients rounded on per session	Ratio	Mean, Range
	<u>Strategy #3</u> Two pain champion discussions	Pain Champion program meeting minutes	Nurse pain champions (all units)	Number of pain champions per discussion	Ratio	Mean, Range

Data Analysis Plan for Project Primary Clinical Question "Was the strategy of change agents effective in achieving implementation of nurse-directed lavender aromatherapy to improve pain management experience in adult patients on a surgical-orthopedic unit of a community hospital?"						
Variable Type	Measure Description	Data Source	Population	Measure Formula	Level of Measurement	Data Analysis Plan
Outcome (Dependent)	Surgical-orthopedic unit adult patient pain management experience for fiscal year (FY) 2019 quarters one through three quarterly percentage scores and Magnet hospital comparison percentiles for the question "During this hospital stay, how often did hospital staff talk with you about how to treat your pain?" will determine if after the intervention the Surgical-orthopedic Unit exceeded the	NRC Picker database	Adult* surgical-orthopedic unit inpatients and adult hospital inpatients completing the NRC picker telephone survey	<u>Percentage:</u> Numerator: Number of patients answering the question "always" Denominator: Number of patients answering the question <u>Percentile:</u> Rank of unit and hospital percentage score as compared to Magnet hospitals in the NRC picker database	Ratio Interval	Range of quarterly percentage surgical-orthopedic unit scores, hospital scores and Magnet comparison scores Range of quarterly Magnet percentiles for surgical-orthopedic unit and hospital

Data Analysis Plan for Project Primary Clinical Question "Was the strategy of change agents effective in achieving implementation of nurse-directed lavender aromatherapy to improve pain management experience in adult patients on a surgical-orthopedic unit of a community hospital?"						
Variable Type	Measure Description	Data Source	Population	Measure Formula	Level of Measurement	Data Analysis Plan
Outcome (Dependent) continued	average score and 50th percentile of Magnet hospitals in the NRC Picker database					

Appendix S

Data Analysis Plan for Project Aims						
Aim #1 To increase the surgical-orthopedic unit patient HCAHPS pain management experience score to equal or above the Magnet average of hospitals in the NRC Picker database by the end of the third quarter of FY 2019.						
Variable Type	Measure Description	Data Source	Population	Measure Formula	Level of Measurement	Data Analysis Plan
Outcome Aim #1 (Dependent)	Surgical-orthopedic unit adult patient pain management experience quarterly percentage scores and Magnet hospital comparison percentiles for the question "During this hospital stay, how often did hospital staff talk with you about how to treat your pain?"	NRC Picker database	Adult* surgical-orthopedic unit patients completing the NRC picker telephone survey	Percentage: Numerator: Number of patients answering the question "always" Denominator: Number of patients answering the question Percentile: Rank of percentage score as compared to Magnet hospitals in the NRC picker database	Ratio Interval	Mean, range of quarterly percentage scores Range of quarterly percentile scores

Data Analysis Plan for Project Aims						
Aim #2 To achieve a consistent practice of 100 % of appropriate patients being offered lavender aromatherapy by the end of the third quarter of FY 2019.						
Variable Type	Measure Description	Data Source	Population	Measure Formula	Level of Measurement	Data Analysis Plan
Outcome Aim #2a (Independent)	The number of surgical-orthopedic unit patients documented to have no contraindication to lavender aromatherapy and who received an offer of lavender aromatherapy reported on a weekly basis for the four weeks of the project and two weeks after the project based on weekly electronic medical record (EMR) documentation (each week= 7 days of patient data)	Weekly MedConnect EMR Report	Adult* surgical-orthopedic unit patients with aromatherapy documentation in the MedConnect EMR database	Numerator: The number of patients documented to have responded “no” to lavender aromatherapy contraindication and documented as verbally responding either “yes” or “no” to an offer of lavender aromatherapy Denominator: The number of patients documented to have responded “no” to lavender aromatherapy contraindication	Ratio	Mean, range of weekly percentage scores

Data Analysis Plan for Project Aims						
Aim #2 To achieve a consistent practice of 100 % of appropriate patients being offered lavender aromatherapy by the end of the third quarter of FY 2019.						
Variable Type	Measure Description	Data Source	Population	Measure Formula	Level of Measurement	Data Analysis Plan
Outcome Aim #2b (Independent)	The number of surgical-orthopedic unit patients documented to have no contraindication to lavender aromatherapy and who received an offer of lavender aromatherapy reported on a weekly basis for the four weeks of the project based on Rounding for Results weekly observation sessions (each week = one rounding session of patient data on one day during that week)	Rounding for Results Excel worksheet	Adult* surgical-orthopedic unit patients who were hospitalized during the Rounding for Results sessions, excluding prisoners and pregnant women	Numerator: Number of appropriate patients (documented pain and not cognitively impaired) with no lavender contraindication documented and education complete documented who with a documented offer of lavender aromatherapy Denominator: Number of appropriate patients (documented pain and not cognitively impaired) with no lavender contraindication documented	Ratio	Mean, range of weekly rounds percentage scores

Appendix T

Data Analysis Plan for Logic Model Outcomes							
Variable Type	Measure Description	Data Source	Population	Measure Formula	Level of Measurement	Data Analysis Plan	Target
Logic Model Short Term Outcome #1A (Independent)	Nurse PCs, surgical-orthopedic unit clinical nurses, and other clinicians can articulate lavender aromatherapy benefits, patient assessment protocol and patient education key points as demonstrated by successful completion with a minimum score of 80% on the Aromatherapy SiTEL Learning Management System module	SiTEL Learning Management System Report	Surgical-orthopedic unit clinical nurses and nurse PCs as of 3/21/2019	Numerator: Number of surgical-orthopedic unit nurses successfully completing module (score of $\geq$ 80%)/ Denominator: Number surgical-orthopedic unit nurses	Ratio	N and Percentage	100% of surgical-orthopedic unit nurses
			All community hospital clinicians completing the module as of 3/21/2019	Descriptive data only Denominator not available for all community hospital clinicians	Ratio	N by unit and by role	No target for all clinicians

Data Analysis Plan for Logic Model Outcomes							
Variable Type	Measure Description	Data Source	Population	Measure Formula	Level of Measurement	Data Analysis Plan	Target
Logic Model Short Term Outcome #1B (Independent)	At each Rounding for Results session, surgical-orthopedic unit clinical nurses, including nurse PCs, articulate intent to offer lavender inhalers to patients	Rounding for Results Excel worksheet	Nurses encountered during Rounding for Results Sessions on the orthopedic-surgical unit	Numerator: Nurses who provide verbal intent to offer lavender Denominator: Number of nurses interviewed on rounds	Ratio	Mean, range of weekly percentage scores	100%
Logic Model Short Term Outcome #1C (Independent)	At each Rounding for Results session, surgical-orthopedic unit patients are observed to appropriately use lavender inhalers	Rounding for Results Excel worksheet	Adult * surgical-orthopedic unit patients who agreed to use lavender	Numerator: Number of patients who agreed to use lavender aromatherapy and who correctly used inhaler Denominator: Number of patients who agreed to use lavender aromatherapy	Ratio	Mean, range of weekly percentage scores	100%

Data Analysis Plan for Logic Model Outcomes							
Variable Type	Measure Description	Data Source	Population	Measure Formula	Level of Measurement	Data Analysis Plan	Target
Logic Model Short Term Outcome #2 (Independent)	At each Rounding for Results session, the number of lavender inhalers will be observed to be at par level for the day	Rounding for Results Excel worksheet	2N and 2 S Supply Rooms of the Surgical-orthopedic Unit	Numerator: Number of yes responses, meaning one or more aromatherapy inhalers are available in the 2N and 2S supply bins at the time of rounds Denominator: Number of Rounding for Results weekly sessions	Nominal	Total percentage of weeks that aromatherapy inhalers were available in the 2N and 2S supply rooms	100%
				Numerator: Weekly number of inhalers in each supply bin Denominator: Weekly par levels for each supply bin	Ratio	Weekly percentage of number of inhalers in bins compared to par levels Range of weekly percentages	No target for weekly percentage

Data Analysis Plan for Logic Model Outcomes							
Variable Type	Measure Description	Data Source	Population	Measure Formula	Level of Measurement	Data Analysis Plan	Target
Logic Model Short Term Outcome #3 (Independent)	Verbal check-in with the nurse manager or charge nurse to validate lavender inhalers were mentioned during their nurse leader rounds with patients	Rounding for Results Excel worksheet	Surgical-orthopedic unit nurse leaders	Numerator: Number of Rounding for Results sessions in which surgical-orthopedic unit nurse leader validates mentioning aromatherapy on leader rounds Denominator: Number of Rounding for Results sessions	Nominal	Total percentage of weeks that surgical-orthopedic unit nurse leader validates mentioning aromatherapy on leader rounds	100%

Data Analysis Plan for Logic Model Outcomes							
Variable Type	Measure Description	Data Source	Population	Measure Formula	Level of Measurement	Data Analysis Plan	Target
Logic Model Medium Term Outcome #1 (Independent)	Surgical-orthopedic unit patients screened for aromatherapy appropriateness/ lavender contraindication	Rounding for Results Excel worksheet	Adult* surgical-orthopedic unit patients	Numerator: Number of cognitively intact** surgical-orthopedic unit patients who had documentation of pain during the admission and documentation of assessment for lavender contraindication Denominator: Number of cognitively intact** surgical-orthopedic unit patients who had documentation of pain during the admission	Ratio	Range of weekly percentages of surgical-orthopedic unit patients cognitively intact** patients with documentation of pain during the admission and documentation of screening for lavender aromatherapy contraindication	Week 1: 20% Week 2: 40% Week 3: 60% Week 4: 80%
Logic Model Medium	Surgical-orthopedic unit						

Data Analysis Plan for Logic Model Outcomes							
Variable Type	Measure Description	Data Source	Population	Measure Formula	Level of Measurement	Data Analysis Plan	Target
Term Outcome #1 (Independent) continued	patients screened for aromatherapy appropriateness/ lavender contraindication continued	Weekly MedConnect EMR Report	Adult* surgical-orthopedic unit patients	Numerator: Weekly total number of surgical-orthopedic unit patients who had documentation of assessment for lavender contraindication Denominator: Weekly total of surgical-orthopedic unit discharges	Ratio	Range of weekly percentages of surgical-orthopedic unit patients with documentation of lavender aromatherapy contraindication screening	Week 1: 20% Week 2: 40% Week 3: 60% Week 4: 80%
Logic Model Medium Term Outcome #2 (Independent)	Surgical-orthopedic unit patients with documentation of no contraindication offered lavender aromatherapy inhalers	Rounding for Results Excel worksheet	Adult* surgical-orthopedic unit patients	Numerator: Number of cognitively intact** surgical-orthopedic unit patients with documentation of pain during admission, documentation of no lavender	Ratio	Range of weekly percentages of cognitively intact** surgical-orthopedic unit patients with documentation of pain during admission, documentation	Week 1: 20% Week 2: 40% Week 3: 60% Week 4: 80%

Data Analysis Plan for Logic Model Outcomes							
Variable Type	Measure Description	Data Source	Population	Measure Formula	Level of Measurement	Data Analysis Plan	Target
Logic Model Medium Term Outcome #2 (Independent) Continued	Surgical-orthopedic unit patients with documentation of no contraindication offered lavender aromatherapy inhalers continued			contraindication, and documentation of patient's response to agree or not agree to use lavender aromatherapy Denominator: Number of cognitively intact** surgical-orthopedic unit patients who had pain during the admission		of no lavender contraindication, and documentation of patient's response to agree or not agree to use lavender aromatherapy	
		Weekly MedConnect EMR Report	Adult* surgical-orthopedic unit patients	Numerator: Weekly total number of surgical-orthopedic unit patients who had documentation of no lavender contraindication	Ratio	Range of weekly percentages of surgical-orthopedic unit patients who had documentation of no lavender contraindication	Week 1: 20% Week 2: 40% Week 3: 60% Week 4: 80%

Data Analysis Plan for Logic Model Outcomes							
Variable Type	Measure Description	Data Source	Population	Measure Formula	Level of Measurement	Data Analysis Plan	Target
Logic Model Medium Term Outcome #2 (Independent) Continued				and documentation of patient's response to agree or not agree to use lavender aromatherapy Denominator: Weekly total of surgical-orthopedic unit discharges		and documentation of patient's response to agree or not agree to use lavender aromatherapy	

Data Analysis Plan for Logic Model Outcomes							
Variable Type	Measure Description	Data Source	Population	Measure Formula	Level of Measurement	Data Analysis Plan	Target
Logic Model Medium Term Outcome #3 (Independent)	Surgical-orthopedic unit patients who demonstrated correct use of the lavender inhalers	Rounding for Results Excel worksheet	Adult* surgical-orthopedic unit patients	Numerator: Number of cognitively intact** surgical-orthopedic unit patients observed to correctly use the lavender inhaler Denominator: Number of cognitively intact** surgical-orthopedic unit patients observed to correctly or incorrectly use the lavender inhaler	Ratio	Range of weekly percentages of surgical-orthopedic unit patients who demonstrated correct use of the lavender inhalers	100% of surgical-orthopedic unit patients will be observed to self-administer lavender inhalers by the end of the fourth week of the DNP student Rounding for Results sessions
Logic Model Medium Term additional data	Percent of screened surgical-orthopedic unit patients with documentation	Weekly MedConnect EMR Report	Adult* surgical-orthopedic unit patients	Numerator: Weekly total number of surgical-orthopedic unit patients who	Ratio	Range of weekly percentages of surgical-orthopedic unit patients who	No target was set for patient agreement to use

Data Analysis Plan for Logic Model Outcomes							
Variable Type	Measure Description	Data Source	Population	Measure Formula	Level of Measurement	Data Analysis Plan	Target
Logic Model Medium Term additional data continued	of no lavender aromatherapy contraindication who agreed to use lavender aromatherapy inhaler.			had documentation of no lavender contraindication and documentation of patient's response to agree to use lavender aromatherapy Denominator: The number of patients documented to have responded "no" to lavender aromatherapy contraindication		had documentation of no lavender contraindication and documentation of patient's response to agree or not agree to use lavender aromatherapy	
Logic Model Long Term Outcome #1 (Dependent) *Same as Project Primary Clinical Question*	Surgical-orthopedic unit adult patient pain management experience for fiscal year (FY) 2019 quarters one through	NRC Picker database	Adult* surgical-orthopedic unit inpatients and adult hospital inpatients completing the NRC	<u>Percentage:</u> Numerator: Number of patients answering the question "always" Denominator: Number of	Ratio	Mean, range of quarterly percentage surgical-orthopedic unit scores, hospital overall scores and Magnet	By the close of the third quarter of FY 2019, surgical-orthopedic unit scores equal or above the average score of Magnet hospitals

Data Analysis Plan for Logic Model Outcomes							
Variable Type	Measure Description	Data Source	Population	Measure Formula	Level of Measurement	Data Analysis Plan	Target
Outcome on page 2 Logic Model Long Term Outcome #1 (Dependent) continued	three quarterly percentage scores and Magnet hospital comparison percentiles for the question "During this hospital stay, how often did hospital staff talk with you about how to treat your pain?"		picker telephone survey	patients answering the question <u>Percentile:</u> Rank of unit and hospital percentage score as compared to Magnet hospitals in the NRC picker database	Interval	comparison scores Range of quarterly Magnet percentiles for surgical-orthopedic unit and hospital overall	in the NRC Picker database By the close of the third quarter of FY 2019, surgical-orthopedic unit scores will rank at the Magnet 50th percentile in the NRC Picker database
Logic Model Long Term Outcome #2 (Independent) Logic Model Long Term	The number of surgical-orthopedic unit patients documented to have no contraindication to lavender aromatherapy and who received an offer of lavender aromatherapy	Weekly MedConnect EMR Report	Adult* surgical-orthopedic unit patients with aromatherapy documentation in the MedConnect EMR database	Numerator: The number of patients documented to have responded "no" to lavender aromatherapy contraindication and documented as verbally responding either "yes" or "no" to an offer	Ratio	Mean, range of weekly percentage scores	100% of patients for the two weeks after the DNP Rounding for Results sessions (weeks five and six)

Data Analysis Plan for Logic Model Outcomes							
Variable Type	Measure Description	Data Source	Population	Measure Formula	Level of Measurement	Data Analysis Plan	Target
Outcome #2 (Independent) continued	reported on a weekly basis for two weeks after the project			of lavender aromatherapy Denominator: The number of patients documented to have responded "no" to lavender aromatherapy contraindication			
	The number of lavender inhalers consumed on the surgical-orthopedic unit and in the hospital overall	Supply Chain Database	Surgical-orthopedic unit and Hospital units.	Number of inhalers reported used on the surgical-orthopedic unit each month.	Ratio	Monthly report of lavender inhaler use by the surgical-orthopedic unit and the hospital overall will be compared with the March and April time periods in the MedConnect EMR weekly reports.	Monthly supply chain consumption reports will approximate the same number of patients using lavender inhalers as documented in the March and April MedConnect EMR weekly reports.

Data Analysis Plan for Logic Model Outcomes							
Variable Type	Measure Description	Data Source	Population	Measure Formula	Level of Measurement	Data Analysis Plan	Target
Logic Model Long Term additional data	Surgical-orthopedic unit patients with documentation of no contraindication and agreement to use lavender aromatherapy inhalers weekly basis for two weeks after the project	Weekly MedConnect EMR Report	Adult* surgical-orthopedic unit patients	Numerator: Weekly total number of surgical-orthopedic unit patients who had documentation of no lavender contraindication and documentation of patient's response to agree to use lavender aromatherapy Denominator: Denominator: The number of patients documented to have responded "no" to lavender aromatherapy contraindication	Ratio	Range of weekly percentages of surgical-orthopedic unit patients who had documentation of no lavender contraindication and documentation of patient's response to agree or not agree to use lavender aromatherapy	No target was set for patient agreement to use
*Adults are patients 18 years of age and older. **Cognition was assessed by the nurse caring for the patient at the time of the Rounding for Results session.							

Appendix U

<table>
<tr><td colspan="8">Project Primary Clinical Question Data Analysis
“Was the strategy of change agents effective in achieving implementation of nurse-directed lavender aromatherapy to improve pain management experience in adult patients on a surgical-orthopedic unit of a community hospital?”</td></tr>
<tr><td colspan="8">Interventions</td></tr>
<tr><td>Change Agent Strategy</td><td colspan="5">Session Attendance and Roles</td><td>Descriptive Statistics</td><td>Strategy Complete</td></tr>
<tr><td rowspan="5"><u>Strategy #1</u>
Three DNP Student-led Lunch & Learns</td><td>Sessions</td><td>RN</td><td>CNA</td><td>US</td><td>Total Attendee</td><td rowspan="5">Attendee number per session range: 5-9
Attendee mean per session: 7
Range among roles: 14 Registered Nurses, 6 Certified Nursing Assistants, and 1 Unit Secretary</td><td rowspan="5">Yes</td></tr>
<tr><td>1</td><td>5</td><td>2</td><td>0</td><td>7</td></tr>
<tr><td>2</td><td>7</td><td>2</td><td>0</td><td>9</td></tr>
<tr><td>3</td><td>2</td><td>2</td><td>1</td><td>5</td></tr>
<tr><td>Total Per Role</td><td>14</td><td>6</td><td>1</td><td>21</td></tr>
<tr><td rowspan="6"><u>Strategy #2</u>
Four DNP student-led weekly Rounding for Results sessions</td><td>Sessions</td><td colspan="4">Patients Per Session</td><td rowspan="6">Mean = 20 patients per session
Range = 18-21 patients per session</td><td rowspan="6">Yes</td></tr>
<tr><td>1</td><td colspan="4">21</td></tr>
<tr><td>2</td><td colspan="4">19</td></tr>
<tr><td>3</td><td colspan="4">18</td></tr>
<tr><td>4</td><td colspan="4">20</td></tr>
<tr><td>Total All Sessions</td><td colspan="4">78</td></tr>
<tr><td rowspan="3"><u>Strategy #3</u>
Two Pain Champion discussions</td><td>Sessions</td><td>Pain Champions</td><td>Pain Champion Leaders</td><td>Total Attendees Per Session</td><td rowspan="3">Mean = 7.5
Range = 7-8

Note: Most pain champions and pain champion leaders attended both sessions.</td><td rowspan="3">Yes</td></tr>
<tr><td>1</td><td>4</td><td>4</td><td>8</td></tr>
<tr><td>2</td><td>4</td><td>3</td><td>7</td></tr>
<tr><td colspan="7">Outcome: Bundle of All Three Strategies</td><td>Met</td></tr>
<tr><td colspan="8">Outcome: Met</td></tr>
</table>

Project Primary Clinical Question Data Analysis

"Was the strategy of change agents effective in achieving implementation of nurse-directed lavender aromatherapy to improve pain management experience in adult patients on a surgical-orthopedic unit of a community hospital?"

After the intervention, the Surgical-orthopedic Unit exceeded the average score and 50th percentile of Magnet hospitals in the NRC Picker database for the question "During this hospital stay, how often did hospital staff talk with you about how to treat your pain?" Scores ranged from 52.2 in FY 19 Quarter 1 to 72.2 in FY 19 Quarter 3.
Percentiles ranged from 12th in FY 19 Quarter 1 to 78th in FY 19 Quarter 3.

Unit/Entity	FY 19 Quarter 1			FY 19 Quarter 2			FY 19 Quarter 3			Total FY 19 Quarters 1-3 Combined		
	Positive	PR	n Size	Positive	PR	n Size	Positive	PR	n Size	Positive	PR	n Size
Surgical-orthopedic Unit	52.2	12	46	63.0µ	43	27	72.2	78	36	61.5	40	109
Hospital Overall	59.3	31	189	66.3	56	166	64.1	46	166	62.9	44	525
NRC Picker Magnet Hospital Benchmark	64.8	50		64.9	50		64.7	50		64.7	50	

µ= sample size below 30 patients and not adequate for statistical reliability as noted in the NRC Picker Database.

Appendix V

Project Aims Data Analysis												
Aim #1 To increase the surgical-orthopedic unit patient HCAHPS pain management experience score to equal or above the Magnet average of hospitals in the NRC Picker database by the end of the third quarter of FY 2019 for the question "During this hospital stay, how often did hospital staff talk with you about how to treat your pain?"												
Outcome: Met After the intervention, the Surgical-orthopedic Unit exceeded the average score and 50th percentile of Magnet hospitals in the NRC Picker database. Scores ranged from 52.2 in FY 19 Quarter 1 to 72.2 in FY 19 Quarter 3. Percentiles ranged from 12th in FY 19 Quarter 1 to 78th in FY 19 Quarter 3.												
Unit/Entity	FY 19 Quarter 1			FY 19 Quarter 2			FY 19 Quarter 3			Total FY 19 Quarters 1-3 Combined		
	Positive	PR	n Size	Positive	PR	n Size	Positive	PR	n Size	Positive	PR	n Size
Surgical-orthopedic Unit	52.2	12	46	63.0µ	43	27	72.2	78	36	61.5	40	109
Hospital Overall	59.3	31	189	66.3	56	166	64.1	46	166	62.9	44	525
NRC Picker Magnet Hospital Benchmark	64.8	50		64.9	50		64.7	50		64.7	50	
µ= sample size below 30 patients and not adequate for statistical reliability as noted in the NRC Picker Database.												

Project Aims Data Analysis

Aim #2 To achieve a consistent practice of 100 % of appropriate patients being offered lavender aromatherapy by the end of the third quarter of FY 2019.

Aim #2a Outcome: Not Met

Based on the weekly MedConnect EMR data below, 100% of surgical-orthopedic unit patients documented to have no contraindication to lavender aromatherapy received an offer of lavender aromatherapy reported on weeks 1, 2, 4, 5, and 6. The goal was not met on week 3. The range of percentages were 91.7% to 100% and the mean was 97.1%.

Cerner MedConnect Electronic Medical Record Aromatherapy Data

Population		Surgical-Orthopedic Surgical Unit							All Hospital Inpatients						
Week/Total		1	2	3	4	5	6	Total	1	2	3	4	5	6	Total
Patient Record Data	Inpatient Records Queried	32	40	45	32	40	31	220	963	1005	1046	1098	1079	1031	6222
	Inpatients with Contraindication to Lavender Documented	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Document-ation Outcomes	Patients with lavender aromatherapy contraindication screening documented*	25.0 % N= 8/32	10.0 % N= 4/40	26.7 % N= 12/ 45	3.1 % N= 1/32	17.5 % N= 7/40	6.5 % N= 2/31	15.5 % N= 34/ 220	1.3% N= 10/ 963	0.4% N= 4/ 1005	1.3% N= 14/ 1046	0.5% N= 6/ 1098	1.3% N= 14/ 1079	0.8% N= 8/ 1031	0.9% N= 56/ 6222
	Percent of patients with lavender aromatherapy offer documented ***	100.0 % N= 8/8	100.0 % N= 4/4	91.7 % N= 11/ 12	100.0 % N= 1/1	100.0 % N= 7/7	100.0 % N= 2/2	97.1 % N= 33/ 34	100.0 % N= 10/ 10	100.0 % N= 4/4	92.9 % N= 13/ 14	100.0 % N= 6/6	100.0 % N= 14/ 14	100.0 % N= 8/8	98.2 % N= 55/ 56
	Percent of patients with documentation of agreement to use lavender aromatherapy****	100.0 % N= 8/8	100.0 % N= 4/4	91.7 % N= 11/ 12	100.0 % N= 1/1	100.0 % N= 7/7	100.0 % N= 2/2	97.1 % N= 33/ 34	100.0 % N= 10/ 10	100.0 % N= 4/4	92.9 % N= 13/ 14	100.0 % N= 6/6	100.0 % N= 14/ 14	100.0 % N= 8/8	98.2 % N= 55/ 56

*Numerator is number of adult (age 18 or older) orthopedic surgical unit patients with Lavender Contraindication/Reaction field documented as "Yes" or "No" and denominator is number of adult (age 18 or older) orthopedic surgical unit patients.

** Numerator is number of adult (age 18 or older) orthopedic surgical unit patients with Lavender Contraindication/Reaction field documented as "Yes" and denominator is number of adult (age 18 or older) orthopedic surgical unit patients with Lavender Contraindication/Reaction field documented as "Yes" or "No."

*** Numerator is number of adult (age 18 or older) orthopedic surgical unit patients with Lavender Contraindication/Reaction field documented as "No" and the Verbal Agreement field documented as "Yes" or "No" and denominator is number of adult (age 18 or older) orthopedic surgical unit patients with Lavender Contraindication/Reaction field documented as "No."

**** Numerator is number of adult (age 18 or older) orthopedic surgical unit patients with Lavender Contraindication/Reaction field documented as "No" and the Verbal Agreement field documented as "Yes" and denominator is number of adult (age 18 or older) orthopedic surgical unit patients with Lavender Contraindication/Reaction field documented as "No."

Project Aims Data Analysis						
Aim #2b Outcome: Not Met Based on Rounding for Results weekly observation sessions, 100% of surgical-orthopedic unit patients documented to have no contraindication to lavender aromatherapy received an offer of lavender aromatherapy on three of four weeks. The goal was not met on week 3. The range of percentages were 66.7% to 100% and the mean was 88.89%.						
Patients/ Outcomes	Description	Week 1	Week 2	Week 3	Week 4	Total
Patients/ Records Observed	Total Patients Rounded	21	19	18	20	78
	Patients Not Appropriate for Aromatherapy Screening Due to Cognitive Impairment or No Pain During Hospitalization	9	7	12	12	40
	Patients with Documentation of Contraindication to Lavender	0	0	0*	0	0
Documentation Outcomes	Goal	20%	40%	60%	80%	N/A
	Appropriate patients** with lavender aromatherapy contraindication screening documented.	16.7% N= 2/12	16.7% N= 2/12	50.0% N=3/6	25.0% N=2/8	23.7% N=9/38
	Goal	100%	100%	100%	100%	100%
	Screened patients with lavender aromatherapy education documented.	100% N= 2/2	100% N= 2/2	66.7% N= 2/3	100% N=2/2	88.89% N=8/9
	Screened patients with lavender aromatherapy offer documented.	100% N= 2/2	100% N= 2/2	66.7% N= 2/3	100% N=2/2	88.39% N=8/9
Observation Outcome	Goal	100%	100%	100%	100%	100%
	Patients with documented agreement to use lavender aromatherapy demonstrating correct use of lavender inhaler.	50.0% N=1/2	50.0% N=1/2	50.0% N=1/2	0.0% N=0/2	37.5% N=3/8
*One patient reported intolerance to lavender, but documentation was not completed. ** Patients without cognitive impairment and with reported pain during the hospital stay.						

Appendix W

<table>
<tr><th colspan="4">Logic Model Outcomes Data Analysis</th></tr>
<tr><th>Variable Type</th><th>Outcome Description</th><th>Measure</th><th>Target/ Outcome</th></tr>
<tr><td rowspan="30">Logic Model Short Term Outcome #1A (Independent)</td><td rowspan="30">Nurse PCs, surgical-orthopedic unit clinical nurses, and nurse PCs articulated: Lavender aromatherapy benefits, patient assessment protocol and patient education key points as indicated by successful completion of the SiTEL Aromatherapy module</td><td colspan="2">Community Hospital Aromatherapy SiTEL Completion by Unit</td><td rowspan="30">Target=100% of surgical-orthopedic unit nurses Outcome= 24/24 surgical-orthopedic unit nurses successfully completed SiTEL module (score of ≥ 80%). Goal Met

No target for all associates</td></tr>
<tr><td>Unit</td><td>N</td></tr>
<tr><td>1 E</td><td>30</td></tr>
<tr><td>1 W</td><td>31</td></tr>
<tr><td>2 E</td><td>19</td></tr>
<tr><td>2 N/2S</td><td>26 (24 RN, 2 CNA)</td></tr>
<tr><td>2 W</td><td>14</td></tr>
<tr><td>Cardiac Cath Lab</td><td>21</td></tr>
<tr><td>ICU/CCU</td><td>39</td></tr>
<tr><td>Nursing Administration</td><td>5</td></tr>
<tr><td>Nursing Education</td><td>3</td></tr>
<tr><td>Orientation</td><td>1</td></tr>
<tr><td>Peri-Operative</td><td>48</td></tr>
<tr><td>Psychiatry</td><td>1</td></tr>
<tr><td>Resource Management & RN Float Pool</td><td>43</td></tr>
<tr><td>Rehab-Stroke Center</td><td>2</td></tr>
<tr><td>Women's Services</td><td>46</td></tr>
<tr><td>Total</td><td>329</td></tr>
<tr><td colspan="2">Community Hospital Aromatherapy SiTEL Completion by Role</td></tr>
<tr><td>Role</td><td>N</td></tr>
<tr><td>Clinical Nurses (Direct Care)</td><td>225</td></tr>
<tr><td>Certified Nursing Assistants</td><td>32</td></tr>
<tr><td>Nurse Leaders</td><td>18</td></tr>
<tr><td>Technicians</td><td>12</td></tr>
<tr><td>Non-Direct Care Nurses</td><td>11</td></tr>
<tr><td>Unit Secretary</td><td>10</td></tr>
</table>

<table>
<tr><th colspan="8">Logic Model Outcomes Data Analysis</th></tr>
<tr><th>Variable Type</th><th>Outcome Description</th><th colspan="5">Measure</th><th>Target/ Outcome</th></tr>
<tr><td>Logic Model Short Term Outcome #1A (Independent) continued</td><td></td><td colspan="5">Community Hospital Aromatherapy SiTEL Completion by Role continued
Role: N
PAs/SAs: 8
Other (Center Hall Coordinator/OR Transport): 5
APRN: 3
RN-Educator: 2
LPN: 2
Physician: 1
Total: 329</td><td></td></tr>
<tr><td>Logic Model Short Term Outcome #1B (Independent)</td><td>Surgical-orthopedic unit clinical nurses, including nurse PCs, articulated intent to offer lavender inhalers to patients at each Rounding for Results session</td><td>Nurses who provide verbal intent to offer lavender</td><td>Week 1
100%
N=
7/7</td><td>Week 2
100%
N=
5/5</td><td>Week 3
100%
N=
5/5</td><td>Week 4
83%
N=
5/6</td><td>Total
96%
N=
22/23</td><td>Target= 100%
Outcome= Not Met Overall (was met three out of four weeks)</td></tr>
<tr><td>Logic Model Short Term Outcome #1C (Independent)</td><td>At each Rounding for Results session, surgical-orthopedic unit nurses’ skills to appropriately use and teach patients to use lavender inhalers was evaluated by observation of patients use of lavender inhalers</td><td>Patients with documented agreement to use lavender aromatherapy demonstrating correct use of lavender inhaler</td><td>Week 1
50%
N=
1/2</td><td>Week 2
50%
N=
1/2</td><td>Week 3
50%
N=
1/2</td><td>Week 4
0%
N=
0/2</td><td>Total
37.5%
N=
3/8</td><td>Target=100%
Outcome= Not met</td></tr>
</table>

Logic Model Outcomes Data Analysis								
Variable Type	Outcome Description	Measure						Target/ Outcome
Logic Model Short Term Outcome #2 (Independent)	At each Rounding for Results session, the par levels for lavender inhalers that were established by the surgical-orthopedic unit nurse leaders were compared with the adequacy and number of lavender inhalers observed	Inhaler Adequacy	Week				Total	Target=100% of weeks inhalers will be available in the supply room bins Outcome= Met 4/4 weeks
			1	2	3	4		
		Inhalers Available in Bin (YES, NO)	YES	YES	YES	YES	4/4 YES	
		Inhaler Count	Week				Total	No target for percentage Nurse leaders increased par levels on week 2.
			1	2	3	4		
		Inhaler Count North Supply Room	6	10	6	8	30	
		Inhaler Par North Supply Room	5	10	10	10	35	
		% Inhaler Count to Par North Supply Room	120%	100%	60%	80%	86%	
		Inhaler Count South Supply Room	3	9	6	8	26	
		Inhaler Par South Supply Room	5	10	10	10	35	
		% Inhaler Count to Par South Supply Room	60%	90%	60%	80%	74%	

Logic Model Outcomes Data Analysis								
Variable Type	Outcome Description	Measure						Target/ Outcome
Logic Model Short Term Outcome #3 (Independent)	At each Rounding for Results session, orthopedic surgical unit nurse leaders, including the nurse manager or charge nurse on duty, validated lavender inhalers were mentioned during their nurse leader rounds with patients	Nurse Leader Rounding	Week				Total	Target= 100% Outcome= Met 4/4 weeks
			1	2	3	4		
		Nurse leader validates mentioning aromatherapy on leader rounds (YES, NO)	YES	YES	YES	YES	4/4 YES	

Logic Model Outcomes Data Analysis								
Variable Type	Outcome Description	Measure						Target/ Outcome
Logic Model Medium Term Outcome #1 (Independent)	Surgical-orthopedic unit patients screened for aromatherapy appropriateness/lavender contraindication	Patient Screening	Week				Total	Target= Week 1: 20% Week 2: 40% Week 3: 60% Week 4: 80% Outcome= Not met on any of the four weeks
			1	2	3	4	N/A	
		Based on Rounding for Results observation: Percent of appropriate patients with lavender aromatherapy contraindication screening documented.	16.7 % N= 2/12	16.7 % N= 2/12	50.0 % N= 3/6	25.0 % N= 2/8	23.7 % N= 9/38	
		Based on weekly MedConnect EMR reports: Percent of patients with lavender aromatherapy contraindication screening documented on Surgical-Orthopedic unit	25.0 % N= 8/32	10.0 % N= 4/40	26.7 % N= 12/ 45	3.1 % N= 1/32	16.7 % N= 25/149	Target= Week 1: 20% Week 2: 40% Week 3: 60% Week 4: 80% Outcome= Met on week 1 Not met weeks 2-4

Logic Model Outcomes Data Analysis								
Variable Type	Outcome Description	Measure						Target/ Outcome
Logic Model Medium Term Outcome #2 (Independent)	Surgical-orthopedic unit patients with documentation of no contraindication offered lavender aromatherapy inhalers	Lavender Aromatherapy Offer	Week				Total	Target= Week 1: 20% Week 2: 40% Week 3: 60% Week 4: 80% Outcome= Met on all four weeks
			1	2	3	4		
		Based on Rounding for Results observation: Lavender aromatherapy offer and education documented if no contraindication.	100 % N= 2/2	100 % N= 2/2	66.67 % N= 2/3	100 % N= 2/2	88.89 % N= 8/9	
		Based on Weekly MedConnect EMR reports: Percent of screened patients with lavender aromatherapy contraindication documented as "No" and lavender aromatherapy inhaler offer documented as "Yes" or "No."	100 % N= 8/8	100 % N= 4/4	92 % N= 11/12	100 % N= 1/1	96 % N= 24/25	
Logic Model Medium Term Outcome #3 (Independent)	Surgical-orthopedic unit patients demonstrated correct use of the lavender inhalers during Rounding for Results sessions	Patient Use of Lavender Inhaler	Week				Total	Target = 100% by week 4 Outcome= Not met
			1	2	3	4		
		Based on Rounding for Results observation: Patient demonstrates correct use of lavender inhaler.	50% N= 1/2	50% N= 1/2	50% N= 1/2	0% N= 0/2	37.5% N= 3/8	

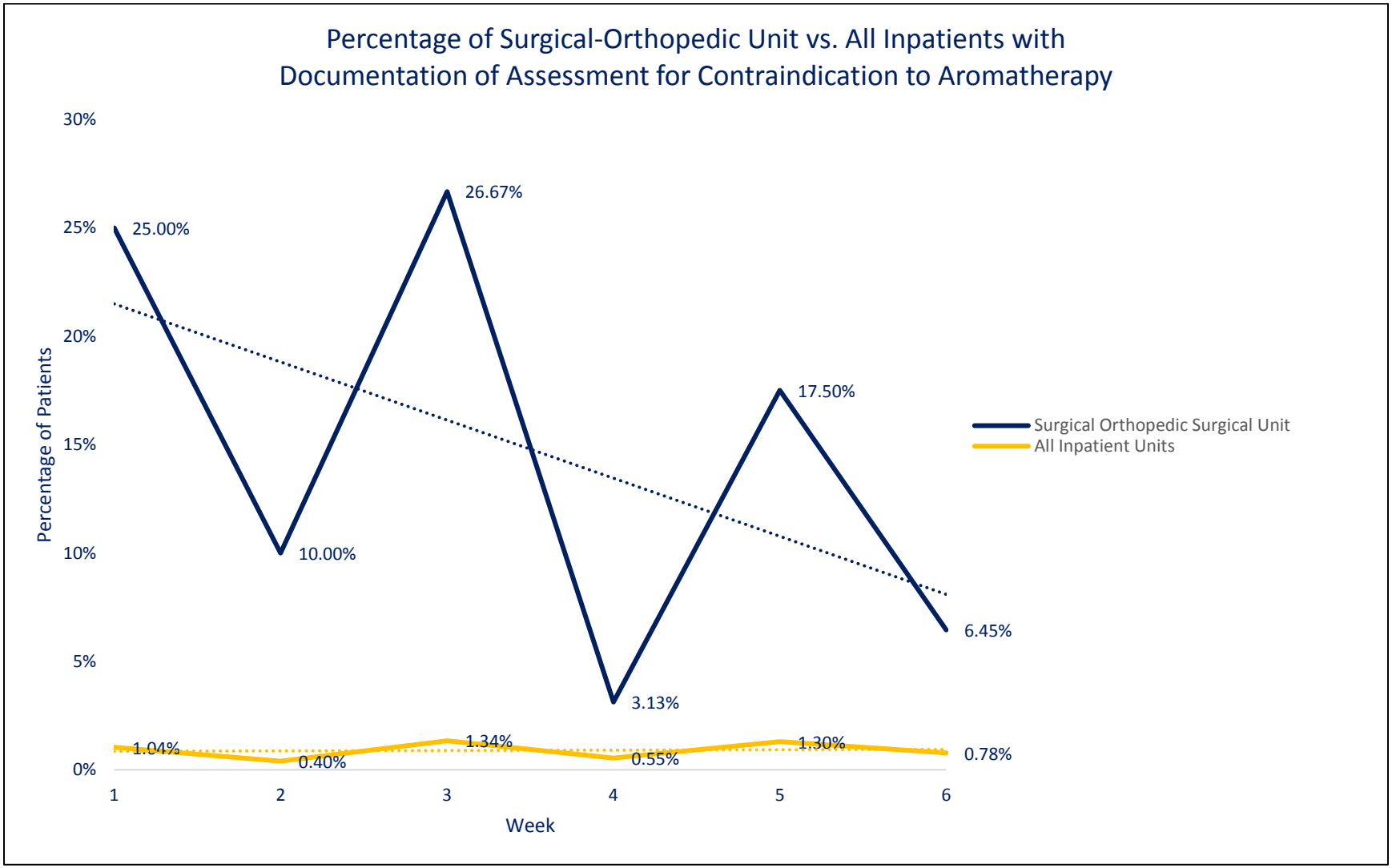
Logic Model Outcomes Data Analysis								
Variable Type	Outcome Description	Measure						Target/ Outcome
Logic Model Medium Term Additional Data	Percent of screened surgical-orthopedic unit patients with documentation of no lavender aromatherapy contraindication who agreed to use lavender aromatherapy inhaler.	Patient Agreement to Use Lavender Inhalers	Week				Total	No target was set for patient agreement to use
			1	2	3	4		
			100% N= 8/8	100% N= 4/4	92% N= 11/12	100% N= 1/1	96% N= 24/25	

Logic Model Outcomes Data Analysis							
Variable Type	Outcome Description	Measure					Target/ Outcome
Logic Model Long Term Outcome #1 (Dependent) *Same as Project Primary Clinical Question Outcome on page 2*	Surgical-orthopedic unit adult patient pain management experience for fiscal year (FY) 2019 quarters one through three quarterly percentage scores and Magnet hospital comparison percentiles for the question "During this hospital stay, how often did hospital staff talk with you about how to treat your pain?"		FY 2019 Quarter				Target = By the close of the third quarter of FY 2019, surgical-orthopedic unit scores equal or above the average score and 50th percentile of Magnet hospitals in the NRC Picker database Outcome= Met
			1	2	3	1-3 Combined	
		Magnet Average	64.8	64.9	64.7	64.7	
		Number of Patient Responses	46	27	36	109	
		Percentage	52.2	63.0µ	72.2	61.5	
		Percentile	12th	43rd	78th	40th	

<table>
<tr><th colspan="8">Logic Model Outcomes Data Analysis</th></tr>
<tr><th>Variable Type</th><th>Outcome Description</th><th colspan="5">Measure</th><th>Target/ Outcome</th></tr>
<tr><td rowspan="6">Logic Model Long Term Outcome #2 (Independent) Similar to Aim #2 Outcome on pages 3 and 4</td><td rowspan="3">The number of surgical-orthopedic unit patients documented to have no contraindication to lavender aromatherapy and who received an offer of lavender aromatherapy reported on a weekly basis for two weeks after the project</td><td>Aromatherapy Offer Post Implementation</td><td colspan="2">Week</td><td>Mean of Weeks 5 & 6</td><td rowspan="2">Target= 100% of patients in the two weeks following the four Rounding for Results sessions (weeks five and six)
Target = Met</td></tr>
<tr><td></td><td>5</td><td>6</td><td></td></tr>
<tr><td>Based on Weekly MedConnect EMR reports: Percent of surgical-orthopedic unit screened patients with lavender aromatherapy contraindication documented as “No” and lavender aromatherapy inhaler offer documented as “Yes” or “No.”</td><td>100%
N=
7/7</td><td>100%
N=
2/2</td><td>100%
N=
9</td></tr>
<tr><td rowspan="4">Based on hospital supply chain, the number of lavender inhalers consumed on the surgical-orthopedic unit and in the hospital overall</td><td>Lavender Inhaler Consumption</td><td colspan="3">Month</td><td>Total</td><td rowspan="4">No Target set for lavender inhaler consumption. Consumption quantity does not match the number of EMR-documented patient uses.</td></tr>
<tr><td></td><td>Feb.</td><td>March</td><td>April</td><td></td></tr>
<tr><td>Surgical-orthopedic Unit</td><td>69</td><td>75</td><td>79</td><td>223</td></tr>
<tr><td>All Hospital Inpatient Units (nine units including surgical-orthopedic unit)</td><td>207</td><td>212</td><td>250</td><td>669</td></tr>
<tr><td></td><td>Surgical Unit Percent of Overall Lavender Inhaler Consumption</td><td>33%</td><td>35%</td><td>32%</td><td>33%</td></tr>
</table>

Logic Model Outcomes Data Analysis						
Variable Type	Outcome Description	Measure				Target/ Outcome
Long Term additional data	Surgical-orthopedic unit patients with documentation of no contraindication and agreement to use lavender aromatherapy inhalers weekly basis for two weeks after the project	Patient Agreement to Use Lavender Inhalers	Week		Mean of Weeks 5 & 6	No target was set for patient agreement to use
			5	6		
		Based on weekly MedConnect EMR reports: Based on Weekly MedConnect EMR reports: Percent of surgical-orthopedic unit screened patients with lavender aromatherapy contraindication documented as "No" and lavender aromatherapy inhaler offer documented as "Yes."	100% N= 7/7	100% N= 2/2	100% N= 9	

Appendix X


Percentage of Surgical-Orthopedic Unit vs. All Inpatients with Documentation of Assessment for Contraindication to Aromatherapy
30%
25%
20%
15%
10%
5%
0%
Percentage of Patients
25.00%
10.00%
26.67%
3.13%
17.50%
6.45%
1.04%
0.40%
1.34%
0.55%
1.30%
0.78%
1
2
3
4
5
6
Week
Surgical Orthopedic Surgical Unit
All Inpatient Units

Appendix Y

DNP Project Approval Signature Sheet

Title: Change Agent Impact on Pain Management Experience through Lavender Aromatherapy: Evidence-Based Practice Project

A Project Presented to the Faculty of the School of Nursing

The George Washington University

In partial fulfillment of the requirements

For the Degree of Doctor of Nursing Practice

By

Karen Mack, MS, MBA, APRN, RN-BC, CCNS, ACNPC

DNP Student

Approved: _____

Mercedes Echevarria, DNP, APN
DNP Primary Advisor

Approved: _____

Kate Driscoll Malliarakis, PhD, ANP-BC, MAC, FAAN
DNP Second Advisor

Approval Acknowledged: _____

Director DNP Scholarly Projects

Approval Acknowledged: _____

Assistant Dean for DNP Program

Date: _____