Southern California CSU DNP Consortium

California State University, Fullerton
California State University, Long Beach
California State University, Los Angeles

USING COMFORT MENU TO IMPACT PAIN EXPERIENCE

A DOCTORAL PROJECT

Submitted in Partial Fulfillment of the Requirements

For the degree of

DOCTOR OF NURSING PRACTICE

By

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ABSTRACT

A quality improvement (QI) project of a comfort menu of nonpharmacological interventions (NPIs) was implemented at a spine surgical unit. The purpose of this QI project was to improve patients' pain experience as measured by pain indicators and length of stay (LOS) in postsurgical spine patients through the development, implementation, and evaluation of a comfort menu of NPIs. The comfort menu consisted of 6 NPIs (acupuncture, pet therapy, hot/cold therapy, virtual reality, music therapy, and reiki/meditation) that are available in the spine surgical unit. Baseline data came from 32 patients who did not utilize NPIs and postimplementation data came from 71 patients who utilized NPIs. Post-comfort-menu implementation showed that the most frequently used NPI was hot/cold therapy (66 out of 71 patients; 92.95%). The aggregate mean Numerical Rating Scale (NRS) pain level decreased from 7 out of 10 (baseline sample) to 6 out of 10 (postimplementation sample), which was a percent change decrease of 14.3%. The aggregate mean net Morphine Equivalent Daily Dose (MEDD$_{n)}$ decreased from 78.10 mg/day (baseline sample) to 48.53 mg/day (postimplementation sample), which was a percent change decrease of 37.9%. The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) pain satisfaction score increased from 71.1% (baseline sample) to 100% (postimplementation sample), which was a percent change increase of 40.6%. Finally, the LOS decreased from 6.56 days (baseline sample) to 3.67 days (postimplementation sample), which was a percent change decrease of

44.1%. The implementation of the comfort menu not only improved spinal surgery patients' pain experience, it also conformed to The Joint Commission's 2018 revised pain management requirements. By providing patients tools to reduce their pain and by including them in choosing the type of nonpharmacological pain management treatments, patients may feel more empowered to utilize these NPIs to reduce their pain beyond their hospital stay.

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BACKGROUND

Problem Statement

Pain management following spinal surgery remains challenging (Montgomery & McNamara, 2016). Given the complexities of these surgeries, it is common for a patient to have a considerable degree of postoperative pain. Therefore, having a full spectrum of pain management options is imperative to improve patients' pain and other pain-related patient outcomes (Montgomery & McNamara, 2016). The availability of pain management options is especially crucial in patients recovering from surgical procedures to address long-standing chronic back pain. Patients with chronic pain require more complex approaches than traditional pain management to relieve their suffering.

Pharmacological interventions are often the first line of treatment following spinal surgery. However, these approaches may have both short- and long-term side effects (Dunn, Durieux, & Nemergut, 2016). Some studies suggest that the use of nonpharmacological interventions (NPIs), such as mind-body treatment, acupuncture, music therapy, and animal-assisted therapy are effective adjuvants for postsurgical pain (Blödt Pach, Roll, & Witt, 2014; Harper et al., 2014; Korhan et al., 2014; Vas et al., 2012). Individually, there is empiric evidence supporting the efficacy of these NPIs. However, healthcare workers' underutilization of these alternatives compared to pharmacological interventions may be due to a lack of awareness of NPIs availability or usability to treat pain.

Local Context

Stakeholders of a 28-bed surgical spine unit in a large California Magnet hospital noted that patients have a prolonged hospital length of stay (LOS) when compared to patients from other surgical units. Baseline data of 32 patients from the last quarter of the year 2017 showed that the average LOS was 6.56 days, which was beyond the goal of 4.24 days. One of the major barriers for discharge was pain. Also, the sample data showed a high aggregate mean patients' Numerical Rating Scale (NRS) pain level of 7 out of 10. Additionally, the aggregate mean net Morphine Equivalent Daily Dose ($MEDD_n$) in a 24-hour period was 78.10 mg/day. Lastly, the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) pain satisfaction score was 71.1%, which was below the goal of 75.4%, signaling a need for an improved pain management approach.

One way to improve pain management is to facilitate utilization of NPIs currently available on the surgical spine unit. Although there may have been multiple contributing factors for the underutilization of NPIs, nurse awareness and commitment to these approaches were possibly lacking. Educating the nursing staff and optimizing the process of accessing these approaches could help to improve patients' pain management experiences.

Purpose Statement

The purpose of this doctoral project was to improve patients' pain experience as measured by pain indicators and LOS in postsurgical spine patients through the development, implementation, and evaluation of a comfort menu of NPIs.

Conceptual Framework

A conceptual framework provides a guide for developing a project or study (Polit & Beck, 2017). In this project, Lewin's Change Theory and Model for Improvement with the Plan-Do-Study-Act (PDSA) cycle facilitated the implementation of the comfort menu quality improvement (QI) project.

Lewin's Change Theory

The author considered Lewin's Change Theory in the implementation of a comfort menu. In the 1950s, Kurt Lewin pioneered the theoretical change model in an organizational setting, which includes a three-stage process known as unfreeze, change, and refreeze (McLean & Hudson, 2012). Lewin's Change Theory considers three concepts: equilibrium, driving forces, and restraining forces. Equilibrium describes the current state of practice or status quo, while driving forces are the factors that promote change and restraining forces are those that hinder change (Kaminski, 2011).

The first stage of Lewin's Change Theory is unfreezing. This stage "examines the motivation to take on the change" (McLean & Hudson, 2012, p. 90). The unfreezing stage requires breaking down the equilibrium or status quo by strengthening the driving forces and decreasing the restraining forces (Sutherland, 2013). In the author's institution, the status quo was characterized with using the standard approach to pain management, primarily focused on pharmacological interventions. It was also characterized by the low-quality indicators including HCAHPS pain satisfaction scores and the increase in LOS for postsurgical spine patients. These quality indicators serve as driving forces to motivate the nursing staff to change their current practice. Restraining forces include nursing staff's resistance to change due to assumptions of more work for them, the lack of NPIs, and the timing of NPI treatments in relation to other treatments such as physical therapy. To mitigate these restraining forces, the author included the stakeholders and frontline nursing staff in the planning and implementation phases of this QI project. As Kaminski

(2011) stated, “The more transparent and inclusive the process is, the more readily people move from the unfreezing state” (p. 2).

Change is the second stage of Lewin's Change Theory and includes identifying “what needs to change and make those changes” (McLean & Hudson, 2012, p. 90). In this stage, the author implemented the comfort menu developed with input from the stakeholders, including the surgical unit’s nurse manager, inpatient pain services, the spirituality department, the volunteer services, the acupuncturist, the virtual medicine department, and the nursing staff on the unit. Factors that were considered for the implementation of this QI project included the availability of NPIs, reliability of implementation, the education needs of the nursing staff, potential effects on nursing workflow, and the overall organizational culture.

The last stage in the Change Theory is refreezing, wherein the proposed change becomes “permanent and sustainable” (McLean & Hudson, 2012, p. 90). Sutherland (2013) stated that teams require support until they are confident in using the proposed change. The process of change does not end after the implementation of the comfort menu. In this stage, it is important to share the QI project’s positive outcomes and to provide ongoing support to the nursing staff (e.g., monthly meetings with the nursing staff, continuing to negotiate with nursing staff to encourage patients to consider using NPIs in addition to pain medication, and stocking needed supplies to name a few).

Model for Improvement with a PDSA Cycle

The implementation of the comfort menu QI project followed the PDSA cycle Model for Improvement. Edward Deming’s PDSA model is a widely used process to aid healthcare teams in improving the quality of care, particularly for “making healthcare safer, more efficient, patient-centered, timely, effective and equitable" (Donnelly & Kirk, 2015, p. 279). In 1994, Langley, Nolan, and Nolan added three basic questions to the PDSA cycle that is now known as the Model for Improvement (Moen, 2009).

The Institute for Healthcare Improvement (IHI) utilizes the Model for Improvement with PDSA cycle (Figure 1) as a framework and guide for accelerating improvement (IHI, n.d.). The first step in implementing a proposed change is to address three questions: 1) What are we trying to accomplish? 2) How will we know that a change resulted in an improvement? and 3) What change can we make that will result in improvement? (IHI, n.d.). The first question involves setting goals. The purpose of this QI project was to improve patients' postsurgical spine pain experience. The second question involved establishing quantitative measures to assess if the implementation of the QI project would lead to the improvement of pain experience through pain indicators. The indicators for a patient's pain included improvements in pain scores, a decrease in opioid use by calculating the $MEDD_n$, and improvement in the HCAHPS score. An additional outcome included shorter hospital LOS. Lastly, the third question involved selecting a specific change. For this project, the change was the implementation of a comfort menu of NPIs to improve pain for spinal surgery patients.

The second step to implementing the Model for Improvement is to test the selected change in a chosen work setting by utilizing the PDSA cycle process (Appendix A). PDSA consists of four steps: plan the change (Plan), implement the change (Do), study the outcomes of the change (Study), and refine the change based on the outcomes (Act; IHI, n.d.).

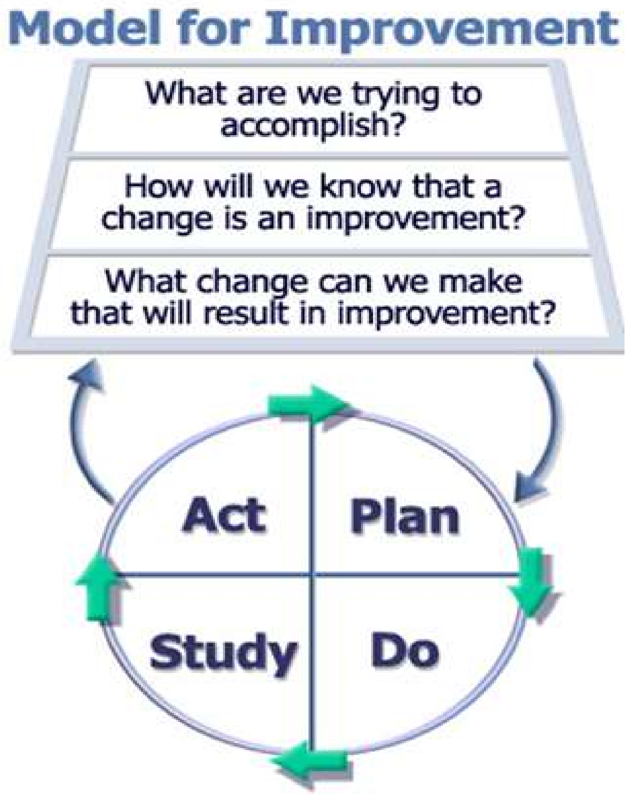

Figure 1. The Model for Improvement (Associates in Process Improvement, n.d.)

PDSA-Plan. This initial step includes the identification of the statement of purpose and formation of an outcome prediction. The author reviewed the current standards of care, collected baseline pain indicators (numerical pain scores, $MEDD_n$, HCAHPS pain satisfaction scores), LOS, and current rate of NPI utilization. Additionally, the author provided the nursing staff with education regarding the use of the proposed comfort menu. Lastly, a team of champion nurses from the unit was formed and support from stakeholders and different departments who currently provide NPIs was obtained.

PDSA-Do. Implementation of the comfort menu occurred during this stage. Specifically, bedside nurses educated patients at the beginning and intermittently during their shift regarding the availability of a comfort menu for pain management. To enhance ease of use and accessibility, a laminated copy of the comfort menu was made available in every patient's room and nursing station. Also, the nursing staff documented the chosen interventions and postintervention pain scores through the hospital's electronic medical record (EMR) as part of the nursing standard of care. Lastly, data collection was started in this stage.

PDSA-Study. Pain indicators (NRS pain level, $MEDD_n$, and HCAHPS pain satisfaction scores) and LOS, both at baseline and at post-comfort-menu implementation, were compared on this stage. Additionally, the author documented thorough descriptions of how the patients and nursing staff used the comfort menu.

PDSA-Act. The Act phase commenced with planning for future adjustments based on lessons learned from the implementation of the comfort menu. This included determining which parts of the intervention would be pushed forward to the next PDSA cycle, such as spreading the use of the comfort menu to the entire organization. Lastly, the author enumerated and discussed the challenges and barriers encountered during the QI project implementation.

REVIEW OF THE LITERATURE

The purpose of this doctoral project was to improve patients' pain experience as measured by pain indicators and length of stay in postsurgical spine patients through the development, implementation, and evaluation of a comfort menu of NPIs. To achieve this purpose, the author performed a comprehensive literature review. Searches involved current practices in managing postsurgical spine pain, the use of NPIs to manage postsurgical spine pain, and the bundling of NPIs in a comfort menu form.

The review is divided into the following sections: (a) managing pain in postsurgical spine patients, (b) use of NPIs to manage postsurgical spine pain, and (c) comfort menu of NPIs. The six types of NPIs were further subcategorized into: (a) acupuncture; (b) mind-body treatment, specifically reiki and meditation; (c) music therapy; (d) hot/cold therapy; (e) pet therapy; and (f) virtual reality (VR) medicine. Literature that were reviewed and included in the paper were summarized on the table of evidence (Appendix B).

Search Strategies

The following databases were reviewed for high-quality evidence to support the aims of the QI project: PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Science Direct, One Search, Google Scholar, and Cochrane Library. The key medical subject headings (MeSH) terms included: "acute postoperative back pain," "acute back pain," "spine surgery," "post-surgical spine," "post-operative spine pain," "pain management," "non-pharmacological intervention," "complementary alternative treatment," "complementary and alternative medicine," and "comfort menu."

Limits on the search included peer-reviewed journals and studies published between 2013 and 2017. Lastly, reviews were limited to adult populations and English language only.

Another literature review search was conducted on the six types of NPIs (acupuncture; mind-body treatment, specifically reiki and meditation; music therapy; hot/cold therapy; pet therapy; and VR medicine) used in this project. Key MeSH terms included: "complementary treatment," "acupuncture," "acupuncture therapy," "mindfulness," "mindfulness breathing," "reiki," "virtual reality," "pet therapy," "animal-assisted therapy," "virtual medicine," "heat therapy," and "cold therapy." Excluded were studies that involved NPIs other than the six identified above.

Managing Pain in Postsurgical Spine Patients

Acute postsurgical pain is a common experience following spine surgery (Montgomery & McNamara, 2016). This procedure is identified in the top six of 179 surgical procedures that cause a high level of pain (Bajwa & Haldar, 2015; Gerbershagen et al., 2013). Often, pain results from the manipulation of structures during surgery, which stimulates pain receptors (Bajwa & Haldar, 2015). However, other than the physical causes of pain, there is also accompanying psychological pain that may be difficult to manage (Puvanesarajah et al., 2015).

Inadequate treatment of postsurgical pain contributes to undesirable patient outcomes, including, but not limited to, the development of chronic pain, increased length of stay, and disability (Bajwa & Haldar, 2015). However, there is currently no gold standard for post spine surgery pain management (Ali et al., 2018; Bajwa & Haldar, 2015; Wainwright, Immins, & Middleton, 2016). Treatment varies from parenteral or oral modalities to neuraxial techniques. Given this range of potential strategies, clinicians are encouraged to investigate evidenced-based treatments that are both comprehensive and multimodal in approach (Bajwa & Haldar, 2015; Wainwright et al., 2016).

Use of NPIs to Manage Postsurgical Spine Pain

The challenges surrounding the management of postsurgical pain calls for utilizing other approaches that are effective, multimodal, and safe. NPIs provide a promising approach that can serve as an adjunctive treatment to standard pain-management techniques. Different organizations have recommended the use of NPIs. The American College of Physicians (ACP) currently recommends the use of NPIs such as superficial heat and acupuncture to treat acute or subacute low back pain (Qaseem et al., 2017). Also, in 2018, The Joint Commission (TJC) revised their pain assessment and management standards to require hospitals to provide nonpharmacologic treatment modalities (TJC, 2017). The commissioners of TJC reasoned that nonpharmacologic treatments might conserve opioid use and help patients achieve a better resolution to their pain (TJC, 2017).

However, studies show that clinicians are often unaware of NPIs' efficacy at alleviating acute pain (Rhee et al., 2015; Tick et al., 2018). This is especially true for the psychological component of pain, which is less understood and more difficult to manage. Clinicians need to look beyond conventional treatments and start embracing multimodal approaches, such as integrating NPIs with traditional therapy. This section reviews the relevant literature of six types of NPIs and describes their effectiveness in managing postsurgical spine pain.

Acupuncture

Acupuncture is the art of stimulating certain points of the body (generally with a needle) to treat a patient's health condition (Tick et al., 2018; Walker, 2017). Acupuncture's mechanism of action suggests that low-frequency acupuncture releases endorphins, encephalins, and endomorphins that activate the mu and delta opioid receptors that regulate pain perception (Lin & Chen, 2008; Walker, 2017). Most importantly, acupuncture fosters self-care, as patients need to engage and commit to continuous treatment for it to be effective (Tick et al., 2018). Given the side effects that come with pharmacological pain treatments, the shift to alternative treatments that do not rely only on pharmacological interventions will continue to become an important part of a patient's treatment (Qaseem et al., 2017; Tick et al., 2018; Walker, 2017).

In systematic reviews, meta-analyses, and randomized controlled trials of acupuncture as an adjuvant to conventional treatment, it was effective in reducing acute low back pain (Vas et al., 2012), postsurgical spine pain (Cho et al., 2015; Chung et al., 2014), and pain from different types of surgery (Wu et al., 2016). There are different forms of acupuncture, of which the most common includes acupoint electrical stimulation (Cho et al., 2015; Vas et al., 2012; Wu et al., 2016). Two studies showed noticeable reduction of postsurgical pain and opioid consumption following acupuncture treatment (Chung et al., 2014; Wu et al., 2016). It is important to note that the added benefits of acupuncture in positively addressing psychological factors associated with pain (e.g., anxiety, fear, and depression) was evident in two studies (Chung et al., 2014; Vas et al., 2012). These findings showed that acupuncture, when used as an adjuvant to conventional treatment, provided a safe, practical, and cost-effective approach to mitigating acute or chronic spine pain.

Mind-Body Therapy

While acupuncture involves the application of a foreign element to physically impact the body, mind-body therapy addresses the psychological concerns of daily living postsurgery, such as fear of physical activity. Another psychological component of pain is pain catastrophizing, wherein a person tends to magnify the anticipation of pain (Quartana, Campbell, & Edwards, 2009). These psychological components of pain require treatment beyond conventional measures (Garland et al., 2017). Psychological factors can exacerbate pain through the pain perception pathway in the cortico-limbic brain, thus providing a logical basis for the possible effectiveness of mind-body therapies (e.g., mindfulness, reiki, guided imagery, and relaxation; Garland et al., 2017; Rhee et al., 2015). Like acupuncture, mind-body therapies encourage self-care by requiring an ongoing commitment to the approach to foster efficacy.

Garland et al. (2017) showed that certain mind-body therapies are effective in providing a significant decline of acute pain and other psychologic factors (e.g., anxiety, stress, disability). On the other hand, two systematic reviews showed variable results in pain intensity, psychological measures, and opioid intake (Nelson et al., 2013; Nicholls et al., 2018). Nicholls et al. (2018) stated that five of the six studies were performed by inexperienced therapists, which could affect the validity of the study, and explain the variabilities seen in the results. Given the diversity of mind-body treatments as well as the different measures of pain, the evidence supporting mind-body therapies is limited, especially for acute postsurgical spine pain. Although evidence is weak to moderate, most studies showed a significant decrease in acute pain and other psychological factors in hospital settings, suggesting that mind-body therapies may be a safe adjunct for postsurgical spine pain.

Music Therapy

Music therapy, while a form of mind-body therapy, is unique because of its outside stimulus that affects the limbic part of the brain. This cortico-limbic process provides a logical effectiveness in changing patient perception of pain (Lingafelt, 2017; Rhee et al., 2015). The Consortium Pain Task Force is an institutional member organization consisting of 72 academic medical centers and health systems (Tick et al., 2018). In line with the Consortium's mission to enhance evidence-based integrative medicine, they recommended music therapy as a nonpharmacologic therapy for acute and chronic pain (Tick et al., 2018).

In a meta-analysis examining the efficacy of music therapy in managing pain, a considerable reduction of chronic pain and distress was noticeable (Lee, 2016; Tick et al., 2018). However, the decrease in pharmacological consumption was insignificant (Lee, 2016; Tick et al., 2018). Systematic Reviews and Meta-Analysis suggested that music therapy mitigates acute pain (both surgical and nonsurgical) when added to usual care regimens in hospitalized patients (Cole & LoBiondo-Wood, 2014; Comeaux & Steele-Moses, 2013; Hole, Hirsch, Ball, & Meads, 2015). However, music therapy's effect on anxiety varies across these studies (Cole & LoBiondo-Wood, 2014; Comeaux & Steele-Moses, 2013). Even though the type of music varies among the studies reviewed, no difference in the subgroup analysis examining the influence of music on anxiety or pain exists (Hole et al., 2015). Hole et al.'s (2015) systematic review and meta-analysis supports the universality of music and shows that music in general, and not a specific type, serves as an important tool when it comes to pain management.

Two studies assessed the effectiveness of music therapy in decreasing pain in patients who underwent spine and thoracic surgery (Liu & Petrini, 2015; Mondanaro et al., 2017). Music effectively decreased pain in these studies; however, the effects on anxiety varied, possibly related to the different outcome measures, the Hospital Anxiety and Depression Scale and the State-Trait Anxiety Inventory. However, regardless of the type of music, patient anxiety was lower when music therapy occurred more frequently (Liu & Petrini, 2015). These studies suggest the potential of music therapy to act as an effective adjuvant in managing postsurgical spine pain, keeping in mind that frequency of treatment may impact its effectiveness.

Hot/Cold Therapy

The use of hot or cold therapy is generally safe and effective when used to treat localized inflammation associated with pain. Superficial heat is currently the first recommendation by the ACP to treat acute and subacute low back pain (Qaseem et al., 2017). Heat physiologically affects the extensibility of collagen, relieves spasms, and can help to relieve joint stiffness (Lewis et al., 2012). On the other hand, local application of cold therapy decreases the body's temperature and reduces inflammation through vasoconstriction (Quinlan et al., 2017).

Recent studies that assessed the effectiveness of hot or cold therapy showed a mild to a marginal decrease of pain scores for different types of pain (Aciksoz, Akyuz, & Tunay, 2017; Lewis et al., 2012; Quinlan et al., 2017). On the other hand, hot or cold therapy applied to distal end radius fractures showed a statistically significant reduction in pain (Patwardhan, Mhatre, & Mehta, 2015). Although Quinlan et al.'s (2017) randomized controlled trial (RCT) showed a considerable decrease of opioid consumption post cold therapy, patients' perception of pain remained constant in both control and intervention groups. It is possible that patients' unchanged perception of pain may influence higher pain-score reporting, but given patients reduced opioid consumption, these pain levels remained at tolerable levels (Quinlan et al., 2017). Also, it is possible that the effectiveness of hot and cold therapy does not vary due to the type of pain, but, rather, that the effectiveness may be based on the kinds of conventional treatments that are concurrently implemented (e.g., positioning and exercise, to name a few). Although further research is necessary, a mild to marginal decrease in pain and a significant reduction of opioid consumption signals that hot/cold therapy is a potential adjunctive treatment for postsurgical spine pain.

Animal-Based/Pet Therapy

Animal-based therapy or animal-assisted therapy is defined by the American Veterinary Medical Association (n.d.) as a "goal-directed intervention in which an animal meeting specific criteria is an integral part of the treatment process," and it "is designed to promote improvement in human physical, social, emotional, or cognitive function" (Harper et al., 2014, p. 373). There are a myriad of benefits of pet therapy (e.g. an increase in quality of life and well-being for older patients; adding to holistic care for patients receiving chemotherapy; and the reduction of cardiovascular risk) (Creagan, Bauer, Thomley, & Borg, 2015; Levine et al., 2013).

There is a scarcity of high-quality studies investigating the efficacy of animal-assisted therapy. However, two studies showed improvements in chronic (Marcus et al.,

2012) and acute postoperative pain (Harper et al., 2014). Both studies (Harper et al., 2014; Marcus et al., 2012) used canines, which always had an animal handler present. However, only one of the studies used animal-assisted therapy as a direct adjunct to conventional treatment (Harper et al., 2014). Both studies showed positive psychological outcomes, such as lower anxiety and stress, as well as improved hospital stay satisfaction (Harper et al., 2014; Marcus et al., 2012). Marcus et al.'s (2012) study set in an outpatient pain clinic demonstrated significant improvements in psychological factors of pain (e.g., anxiety, irritability) among patients' family and staff. This study found that animal-based therapy not only improved patients' perception of pain, but also found that families and staff who enjoyed petting the dogs similarly reported improvement in emotional distress and feelings of well-being. The frequency of animal-based treatment also affected the impact on patients' pain, as seen on patient reports of significantly higher pain relief after receiving >10 minutes compared to those receiving < 5 minutes of animal-assisted therapy (Marcus et al., 2012). The significant effect of animal-based therapy as an adjunctive treatment for acute pain following total joint arthroplasty (Harper et al., 2014) showed a definite potential benefit for postsurgical spine pain.

Virtual Reality

Virtual Reality technology "provides an immersive, multisensory, and three-dimensional (3D) environment that enables users to have modified experiences of reality by creating a sense of 'presence'" (Tashjian et al., 2017, p. 2). Studies conducted in a burn wound care center showed that because of its *immersive* properties, VR distracted patients from their pain, thus reducing their pain (Li et al., 2017; Tick et al., 2018). VR's immersive and distractive properties potentiate its applicability as an adjunctive treatment in managing postsurgical spine pain.

Distractive properties of VR were visible among patients with acute pain while undergoing dressing changes and variable acute pain in hospital settings (Guo, Deng, & Yang, 2015; Tashjian et al., 2017). Recent studies suggested that VR has a positive pain effect, specifically for patients suffering from an acute type of pain (Guo, Deng, & Yang, 2015; Minyoung et al., 2016; Tashjian et al., 2017). On the other hand, VR acts as a motivational tool for patients with pain to complete rehabilitation-type activities (Minyoung et al., 2016). In other words, while VR provided a distraction from pain in two studies (Guo, Deng, & Yang, 2015; Tashjian et al., 2017), it provided a motivational push for patients who are in pain to do an activity that may cause pain rather than to avoid the activity (Minyoung et al., 2016). Because of limitations (e.g., seizure, neck instability, motion sickness) and side effects (e.g., nausea) that come with VR therapy (Tashjian et al., 2017), it is important for clinicians to use this type of NPI with caution and assess a patient's condition before utilizing VR. Although further research is necessary, current data on VR therapy has shown positive outcomes for acute pain, which indicates that VR can act as an adjunctive treatment for managing postsurgical spine pain.

Comfort Menu of NPIs

A comfort menu provides a patient with multiple options of proven supplementary therapies from which to pick. The concept of having a comfort menu is not a novel one; however, there were no studies available to test its effectiveness on pain outcomes directly. This QI project assessed whether there was an improvement of postsurgical spine pain when nurses provided patients with a comfort menu of available

NPIs. The use of a comfort menu requires that patients, clinicians, and nurses are aware of the available NPIs on their unit. The nurses' or clinicians' attitudes towards NPIs or complementary therapies may also affect their willingness to offer this therapy; thus, educating them was a part of this QI project. Finally, by providing patients tools to reduce their pain and by including them in choosing the type of nonpharmacological pain management treatments, patients may feel more empowered to utilize these NPIs to reduce their pain beyond their hospital stay.

Conclusion

Evidence suggests these NPIs are potentially effective on their own. However, it is possible that either a lack of awareness or the lack of a structure that facilitates the use of NPIs by both clinicians and patients may be the reason for their underutilization. Most of the NPIs reviewed do not have a direct impact on postsurgical spine pain, which can be due to limitations set (e.g., < 5 years of study included, limited to adults only). However, the positive pain effects of each NPI, especially on acute types of pain, signal a potential effectiveness in managing postsurgical spine pain. It is important to note that NPIs frequency, dosing, uniformity of measuring tools, ongoing support by staff, and types of conventional treatment concurrently given play a significant role in NPI efficacy. Overall, the six types of NPIs reviewed generally showed safe, practical, and cost-effective effects when used to treat acute pain.

METHODS

The purpose of this doctoral project was to improve patients' pain experience as measured by pain indicators and length of stay in postsurgical spine patients through the development, implementation, and evaluation of a comfort menu of NPIs. This section describes the project's design, setting, participants, ethical consideration, development and implementation of intervention, measurement tools, data collection, and analysis.

Design

This project used a QI approach to develop, implement, and evaluate a comfort menu of NPIs for improving postsurgical spine patients' pain indicators and LOS. Pain indicator outcomes included pain level as measured by the NRS, opioid requirement as measured by net $MEDD_n$ and pain satisfaction score as measured by Press Ganey's HCAHPS. An additional outcome was patients' hospital LOS.

Preliminary Work

The author completed a preliminary assessment of pain indicators (NRS pain level, $MEDD_n$, and HCAHPS pain satisfaction score) at the spine surgical unit using a retrospective chart review of 32 patients who did not utilize any NPIs from October to December 2017. Additionally, the author reviewed the LOS of the 32 patients during the same period. Patients had a mean NRS pain level of 7 out of 10. The mean $MEDD_n$ in a 24-hour period was 78.10 mg/day; one patient used about 654 mg $MEDD_n$ in a 24-hour period, which was considered an outlier, thereby that patient's opioid consumption was removed in calculating the mean $MEDD_n$. The HCAHPS pain satisfaction score for the unit was 71.1%, which was below the goal of 75.4%. Additionally, the LOS for postsurgical spine patients was 6.56 days, which was beyond the goal of 4.24 days. These findings signaled a need to improve the quality of pain management care for postsurgical spine patients.

Setting

The QI project took place on a 28-bed spine surgical unit at a large California Magnet hospital. There are approximately 10 spine surgeons who perform various spine surgeries, including laminectomies, discectomies, and spinal fusions. Lastly, nurse to patient ratio in this unit is 1:4.

Participants

A convenience sample of patients admitted to the surgical unit served as the project's sample. Inclusion criteria were 16 years or older and having undergone spine surgery. Exclusion criteria included patients who did not undergo spine surgery, had altered mental state diagnosed by the admitting physician (ICD-10 codes R41.82 and F09), were unable to follow instructions for NPI use (assessed by the registered nurses using the Glasgow coma scale), and refused NPIs. Specific exclusion criteria for virtual reality (VR) use included visual impairment, history of seizure disorder, motion sickness, and active nausea or vomiting.

Ethical Issues

Institutional Review Board (IRB) approval was sought for this QI project (Appendix C). The author requested frontline nurses' participation, with the caveat that participation was not mandatory. A comfort menu functions as a new tool for utilizing NPIs that are already in practice and provides minimal risk to nurses and patients. The author gathered NRS, $MEDD_n$, LOS and rate of NPI use from the electronic medical record (EMR). All digital data for this project were deidentified and stored in a password-protected computer. The hospital's IRB determined this project to be nonresearch and, as such, did not require oversight by the IRB (Appendix D).

Procedures

I. Planning

- Met with the stakeholders to review timeline, procedures, and outcomes.
- Identified nurses from the spine surgical unit to act as comfort menu champions.
- Developed comfort menu for patients and nursing staff.
  - Identified and developed content
    - Comfort menu for patients (Appendix E) includes brief information and an image of each NPI available at the unit:
      - Acupuncture
      - Mind-body therapies (reiki and meditation)
      - Music therapy
      - Hot/cold therapy
      - Animal-based therapy
      - Virtual Reality
    - Comfort menu instructional guide for nursing staff (Appendix F) includes information about how to order each NPI in the EMR charting. Additionally, departmental information such as office hours and phone numbers were included.
  - Developed initial prototype and piloted with four nurses (not champions).
  - Collected qualitative feedback.
  - Revised prototype based on feedback collected.

    - Presented latest prototype to unit stakeholders and all staff and requested feedback.
    - Finalized menu for patients and nursing staff.
        - Comfort menu for patients (laminated menu placed on a patient's bedside table or board).
        - Comfort menu for nursing staff (laminated menu located in nursing station).

II. Preimplementation

- Developed educational content for nursing staff sessions.
    - QI project goals, aims, and timeline.
    - Each NPI's effectiveness based on literature.
    - Inclusion/Exclusion criteria of the project.
    - How to order each NPI, phone numbers, and departmental information.
    - Monitor for potential adverse effects or side effects from NPI use.
    - Assess and document NRS pain level, opioid use, and NPI used as part of standard of care.

III. Implementation

- Conducted 1-hour educational sessions with nursing staff. The author and pilot team arranged three sessions to accommodate unit schedule.
- Comfort menu went live on the 28-bed spine surgical unit mentioned during the Unit Practice Council meeting.

    - Nursing staff explained the comfort menu to the patients every shift or as needed. For patients who used NPI as adjuvant treatment, nursing staff:
        - Performed standard of care as required.
        - Assessed and documented NRS pain level.
        - Assessed and documented opioid use.
        - Assessed and documented NPI use.
        - Stopped NPI use for any adverse effects or events and documented such events.

IV. Postimplementation

- Obtained IRB approval from California State University, Long Beach (Appendix C), and from the medical center (Appendix D). Additionally, an institutional clearance to disseminate and publish was obtained from the medical center (Appendix G).
- Obtained list of patients from EMR who had spine surgery and received NPI treatment from July 16 to September 16, 2018.
- Began chart review and data collection using data extraction tool.
    - Data extraction tool (Appendix H):
        - Case#
        - Age
        - Gender
        - Type and level of spine surgery
        - Previous spine surgery

        - Baseline MEDD use, if any
    - Primary outcome extraction tool (Appendix I):
        - Postoperative Day (POD) when NPI used
        - POD 24-hour mean NRS pain level
        - POD 24-hour MEDD use (Appendix J)
        - $MEDD_n$= (Baseline MEDD – 24-hour MEDD use)
        - Number of NPIs used during the entire LOS
        - Specific NPI(s) used during the entire LOS
- Collected HCAHPS pain satisfaction score on the unit (available monthly). Specific pain satisfaction HCAHPS questions:
    - During this hospital stay, did you have any pain?
    - During this hospital stay, how often did the hospital staff do everything they could help you with your pain?
    - During this hospital stay, how often was your pain well controlled?
- Calculated LOS of the patients included in the project by counting the hospital stay from admission to the date of discharge.
- Collected data was deidentified and chronologically numbered and entered in an Excel spread sheet in the author's laptop and was password protected.
- Collected open-ended survey from the nursing staff (Appendix K).

Measurement Tools

NRS Pain Level

Pain assessment varies depending on different factors such as age, mentation, and sedation level, to name a few. The NRS is an 11-point scale, where the extreme ends are either no pain or the worst pain imaginable (Williamson & Hoggart, 2005). In a review by Williamson and Hoggart (2005), NRS was found to be more sensitive and more audit- and research-friendly than other pain assessment tools. Multiple studies have shown the validity and reliability of NRS in assessing pain (Ferreira-Valente, Pais-Ribeiro, & Jensen, 2011; Göransson, Heilborn, Selberg, von Scheele, & Djärv, 2015; Hjermstad et al., 2011). At the author's institution, NRS was the chosen method of assessing pain in the adult surgical spine unit. Additionally, assessment of patients' pain at the author's institution occurred every 4 hours, before and after an intervention, and as needed.

MEDD

MEDD is a conversion tool that assesses the equianalgesic potency of different opioids (Rennick et al., 2016). The MEDD is calculated by converting each opioid taken in a 24-hour period to MEDD using the equianalgesic chart (Appendix L). Equianalgesic conversion is a common method of estimating opioid potency and is useful when converting one opioid to another (Rennick et al., 2016). Additionally, the Centers for Disease Control and Prevention (CDC) uses MEDD as part of the safe opioid prescribing recommendation in calculating total daily dose (CDC, n.d.). Although there is no current universally accepted opioid conversion, clinicians widely use MEDD, and it is the only opioid consumption calculation used at the author's institution.

Hospital LOS

Assessing LOS is now part of patient outcome indicators (Brasel, Lim, & Nirula 2007). About one third of U.S. healthcare costs consist of inpatient hospital stays (Agency for Healthcare Research and Quality [AHRQ], n.d.). Because of the known healthcare cost of increased hospital stays, hospitals are financially incentivized to decrease patients' LOS (AHRQ, n.d.). The author calculated LOS of the patients (baseline and postimplementation group) included in the project by counting the hospital stay from admission to the date of discharge.

HCAHPS Pain Satisfaction Score

The HCAHPS survey is a standardized national survey that is acquired from a patient's perception of how he or she was cared for during a hospital stay (Centers for Medicare & Medicaid Services, n.d.). Furthermore, the Patient Protection and Affordable Care Act of 2010 included HCAHPS measurement in the calculation of value-based incentive payments (Centers for Medicare & Medicaid Services, n.d.). These measures incentivized hospitals to enact the required component of HCAHPS, wherein pain management is one key driver. Specific pain control questions were: During this hospital stay, did you have any pain? During this hospital stay, how often did the hospital staff do everything they could to help you with your pain? And lastly, during this hospital stay, how often was your pain well controlled? There were limited studies that assessed the validity and reliability of the HCAHPS survey. However, a few studies showed that the HCAHPS survey provides high reliable measurement of patient experiences (Dockins, Abuzahrieh, & Stack 2015; Elliott et al., 2009). The author's institution utilizes the HCAHPS survey and results for the spine surgical unit are used as quality patient outcome indicators.

Data Analysis

Patients' demographic data were described with measures of central tendency (e.g., means, standard deviations, and percentages). The author created descriptive tables and graphs to describe the effects of NPIs on $MEDD_n$ and NRS pain levels.

NRS Pain Level

The author compared the aggregate mean and standard deviation (SD) of NRS pain levels of patients who did not used NPI (baseline sample) and those who used the NPI (postimplementation sample). Lastly, to assess the degree of change caused by the comfort menu implementation, the percentage of change was calculated by comparing mean NRS pain level from postimplementation to baseline.

$MEDD_n$

The author calculated the MEDD 24-hour consumption per patient (Appendix J). The author then calculated the net Morphine Equivalent Daily Dose ($MEDD_n$) by deducting a patient's baseline opioid use from the 24-hour opioid consumption used on the day that an NPI was used. The sum $MEDD_n$ from all patients (numerator) divided by the total number of patients (denominator) produced the aggregate mean $MEDD_n$ score postimplementation. The author then compared the mean $MEDD_n$ scores of the baseline and post-comfort-menu implementation. Additionally, the author compared the aggregate baseline and postimplementation mean and standard deviation (SD) $MEDD_n$ scores of all patients. Lastly, to assess the degree of change caused by comfort menu implementation, the percentage of change were calculated by comparing mean $MEDD_n$ from postimplementation to baseline.

LOS and HCAHPS Pain Satisfaction Scores

The author calculated LOS of the patients (baseline and postimplementation group) included in the project by counting the hospital stay from admission to the date of discharge. The HCAHPS pain satisfaction scores are acquired monthly by the nursing management.

RESULTS: PROJECT MANUSCRIPT

A manuscript was created and submitted to *The Joint Commission Journal on Quality and Patient Safety,* the official journal of TJC. *The Joint Commission Journal on Quality and Patient Safety* is a peer-reviewed publication with goals of disseminating information to improve the quality and safety of health care. The submitted manuscript is shown in Appendix M.

DISCUSSION

The NPIs improved all pain outcome indicators and LOS as evidenced by a decrease in NRS pain levels (a percent change of 14.3%), a decrease in opioid consumption (a percent change of 37.9%), an increase in HCAHPS pain satisfaction scores (a percent change of 40.6%), and a decrease in LOS (a percent change of 44.1%) as compared to baseline. There was a decrease, on average, in the aggregate mean NRS pain level from 7 (baseline) to 6 (postimplementation) out of 10; clinically, this slight change could indicate a drop in the pain grade from severe to moderate, on average, after the implementation of the comfort menu. There was a clinically significant decrease in aggregate mean opioid consumption from $MEDD_n$ of 78.10 mg/day (baseline) to 48.53 mg/day (postimplementation). The decline of opioid consumption reduces a patient's risk for opioid overdose. The CDC recommends that clinicians practice caution in increasing dosage greater than 90 morphine equivalent per day as this increases the threshold risk for opioid overdose (CDC, n.d.). However, it should be noted that at the time of the implementation of the comfort menu, other house-wide opioid mitigating initiatives (e.g., staff education, opioid overdose tracking, to name a few) were concurrently being implemented at the institution. Therefore, the decline of opioid use can also be attributed to the LOS which decreased from 6.56 days (baseline) to 3.67 days (postimplementation).

The HCAHPS pain satisfaction score increased from 71.1% to 100%. However, the increase of the HCAHPS pain satisfaction scores should be interpreted with caution because HCAHPS' developers revised the question that assesses the pain experience in early 2018. The revised HCAHPS pain satisfaction question assesses patients about hospital staff's communication with them about their pain ("During this hospital stay, how often did hospital staff talk with you about how much pain you had?"). Whereas, the question in the baseline sample asked patients to evaluate how often was their pain controlled ("During this hospital stay, how often was your pain controlled?" [TJC, 2017]). The change in question, as well as the concurrent hospital wide opioid reduction initiative, may have contributed to the improvement of HCAHPS pain satisfaction score.

The majority of patients during the implementation period of the comfort menu used hot and cold therapy (92.95%). Since hot and cold therapy was the most commonly used NPI, the mild reduction of pain outcome may be attributed to this specific NPI. Similar to current literature, the project outcome also showed that hot and cold therapy resulted in a mild reduction in pain scores (Aciksoz, Akyuz, & Tunay, 2017; Lewis et al., 2012; Quinlan et al., 2017). Although the result is mild, superficial heat or cold therapy is generally safe and effective and thereby recommended by the ACP to be the first line of treatment for acute postoperative pain and subacute low back pain (Qaseem et al., 2017). Additionally, due to its easy accessibility, nurses and patients may tend to use it more in comparison to other NPIs. Pet therapy (12.67%) was the second most commonly used NPI in this project. However, the nursing staff commented that one of the barriers of pet therapy's utilization was the limited availability of pets since it was a volunteer type of service.

The nurses involved with the QI project identified several approaches to improve the use of NPIs for their patients. These include offering the comfort menu consistently by the RNs and ensuring communication with patients about their preference about which NPI they are willing to try first thing during their morning rounds. Also, due to issues of accessibility, certain NPIs such as acupuncture, reiki, meditation and pet therapy needed to be ordered or arranged in advance. Another nursing suggestion includes encouraging NPI education at the bedside, especially on admission, and after admitting a patient from the recovery room. Lastly, nurses suggested that providers consider educating their patients at the clinic about the NPIs. By introducing the availability of NPIs as early as the preoperative stage, patients may take the time to learn more about them and decide which ones best fit with their preferences and what they know work for their pain.

Limitations

The QI project was implemented in postsurgical spine patients and cannot be generalized to other patients who had other types of surgery. Most patients used hot and cold therapy, thus improvement of pain outcomes may be attributed to this specific NPI. However, there were not enough numbers of patients who used other forms of NPIs, therefore assessing the effects of rarely used NPIs on pain outcomes was not feasible. Availability of information was dependent on whether the nursing staff documented the NPIs as a pain intervention, thereby the possibility of missing patients who received the NPI during the implementation period is possible. Nursing staff's bias with regards to the type of NPI may also have had an indirect impact on a patient's choice of an NPI. Additionally, certain NPIs that required additional steps, such as ordering in the electronic health record or calling a department, may have discouraged interest amongst patients or staff if they were not readily available.

Conclusions

The QI project of a comfort menu of NPIs showed that NPIs improved patients' pain experience as evidenced by a decrease in NRS pain levels, a decrease in $MEDD_n$ opioid consumption, an increase in HCAHPS pain satisfaction scores, and a decrease in

LOS as compared to baseline. The implementation of the comfort menu not only improved spinal surgery patients' pain experience, it also conformed to TJC 2018 revised pain management requirements. However, caution is warranted in generalizing our results in that several pain management initiatives were being implemented concurrently during the period of this project. By providing patients the tools to reduce their pain and by including them in choosing the type of pain management treatments, patients may feel more empowered to utilize these NPIs to reduce their pain beyond their hospital stay.

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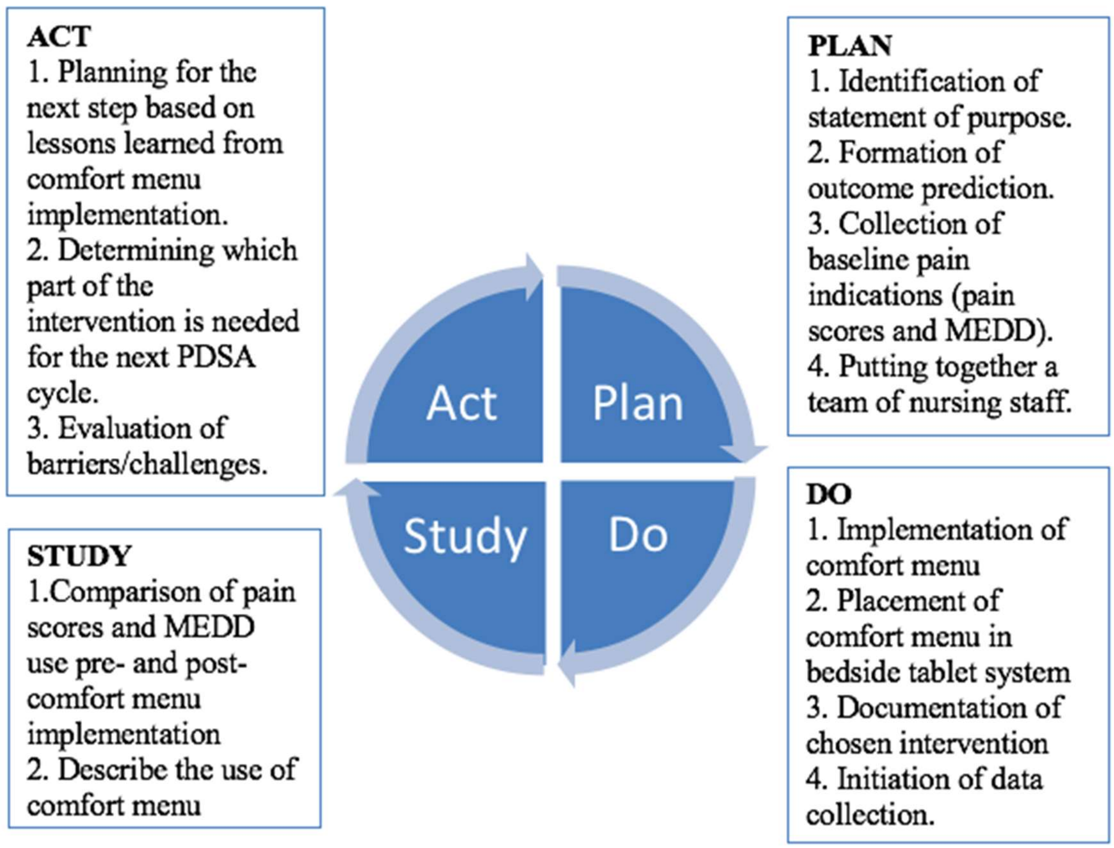
APPENDIX A

THE PLAN-DO-STUDY-ACT MODEL



Note. PDSA cycle adapted for implementation of comfort menu (Associates in Process Improvement, n.d.)

APPENDIX B

TABLE OF EVIDENCE

Table 1

Acupuncture as NPI for Managing Postsurgical Spine Pain

Purpose	Design & Key Variables	Sample & Setting	Measures	Results	Conclusions & Limitations
To evaluate the effectiveness of acupuncture in postoperative pain. Planned subgroup analysis (acupuncture, electroacupuncture, TEAS, and control) (Wu et al., 2016)	Systematic Review and Meta-Analysis using PRISMA guidelines IV: Acupuncture and acupuncture related treatments. DV: Assessed on first day of surgery 1° (pain scores) 2° (opioid analgesia use)	MEDLINE, Cochrane Library, & Embase searched from inception until Sept. 30, 2014. N=13 studies IC: Adult >18 years, undergone surgery, received acupuncture. English or Chinese language only. EC: Auricular acupuncture, nonoriginal studies, outcomes (pain scores/opioid use) not presented quantitatively.	1° : Pain intensity measured via NRS and VAS 2°: Opioid analgesia use calculated using the cumulative amount (sum) of opioid (mg) in 24 hours.	1° & 2°: Acupuncture and related treatment group show less pain and less opioid use compared to control (P<0.001) Subgroup result: Acupuncture and TEAS has less pain compared to electroacupuncture and control. TEAS show significant opioid use (P<0.001)	Acupuncture and other acupuncture related Tx is effective in treating postoperative pain and reduce opioid use Limitations: heterogenous type of surgeries, different controls, different types of acupuncture, only assessed first day of surgery, reduction of opioid side effects were not assessed. Acupuncture treatment may serve as an effective adjunctive treatment for patients with postoperative pain.
To evaluate the acupunctures' effectiveness in treating acute postoperative	Systematic Review and Meta-Analysis of RCT studies	CENTRAL, MEDLINE, EMBASE, PubMed, AMED, CINAHL, & chinese,	Assessed in different times (0.5 hr, 1 hr, 2 hr, 6 hr, 24-hr, 72-hr, 1 week, 1 month, 3	1° Decrease in VAS pain scores with acupuncture Tx (p=0.0003).	While acupuncture treatment shows no change in opioid use. There is improvement

Purpose	Design & Key Variables	Sample & Setting	Measures	Results	Conclusions & Limitations
pain following back surgery. (Cho et al., 2015)	IV: Acupuncture Tx DV: 1° (pain scores and opioid demand) 2° (adverse events of acupuncture)	Korean, Japanese databases searched from inception until Sept. 2012. N=5 RCT IC: RCTs of acupuncture as Tx for pain after back surgery, <1 week after back surgery, all language. EC: non-RCT, needling on nonacupuncture sites, acupuncture plus herbal medicine, chronic postoperative pain, unable to distinguish whether it is acute or chronic pain, anesthesia side effects.	months before and after surgery) 1° (pain scores measured via VAS; opioid demand use calculated using the sum of opioid (mg)) 2° Adverse events of acupuncture	1° No statistical difference in opioid demands (p=0.21) 2° 1 RCT reported that there were no adverse events	in pain on acute postoperative pain after back surgery. Limitations: Possible presence of performance bias on included studies, validity of use of relevant sham control, possible ethical issues with sham control. Acupuncture Tx may serve as an effective adjunctive treatment for patients with acute postoperative pain after back surgery.
To assess the effectiveness of IAS on postoperative pain and morphine-related side effects. (Chung et al., 2013)	Single-blinded, sham controlled study with three groups IV: 3 Tx groups: 1.Control (no IAS) 2.IAS (auricular acupressure with TEAS) 3.Sham (acupoint stimulation without embedding seeds/pressure) DV: Assessed during 72 hours after surgery	N= 135 (45 each group). Treatment group (IAS and Sham) randomly assigned. Dropout rate of 5.9%. IC: Back surgery, 18 years or older, received general anesthesia, consent to PCA use, return to ward directly from recovery room. EC: Antiemetics or morphine use before	Baseline outcome: 1.Pain assessed via VAS 2.Anxiety assessed via STAI 3.Depression assessed via TDQ After surgery: 1.Pain assessed via VAS 2.Opioid consumption calculated using the equianalgesic morphine consumption	Baseline outcomes: (VAS, STAI and TDQ were not significantly different) After surgery: (assessed in different times during the 72 hours after surgery) 1.VAS showed significant decrease over time in IAS group 2.Morphine equivalent consumption is less in IAS group (P=0.001)	IAS showed improvement in pain, reduction in opioid consumption and side effects. Limitations: presence of selection bias with nonrandomized cohort, nongeneralizable sample population, acute and chronic pain not distinguished. IAS as type of acupuncture may serve

Purpose	Design & Key Variables	Sample & Setting	Measures	Results	Conclusions & Limitations
	1.Baseline preoperative pain, anxiety and depression 2.Pain intensity, opioid consumption and morphine side effect after surgery.	surgery, pacemaker, arrhythmia or epilepsy, opioid dependence, cardiovascular disease, abnormal shape of earlobes, lesions at application sites. Orthopedic ward in a 2909 medical center in Taiwan	3.number of morphine side effects measured from 0-4 (e.g. dizziness, nausea/vomiting, itching, sedation, hypotension)	3.Morphine related side effects is less in IAS ($P<0.001$). Between group difference ($P=0.048$)	as adjunctive Tx for pain after lumbar spine surgery.
To (1) Compare the effectiveness of acupuncture with conventional treatment to conventional treatment alone in patients with nonspecific acute low back pain. (2) Determine the specificity of acupuncture points and techniques administered to patients with nonspecific acute low back pain. (Vas et al., 2012)	RCT Design IV: 4 treatment groups: (1). Conventional Treatment alone (pharmacological treatment, remaining active, avoiding alarmism) (2-4). Five 20-min sessions over 2 weeks of Acupuncture (True, Sham or Placebo Acupuncture) with Conventional Treatment. DV: 1° outcomes: Clinically Relevant Improvement in low back pain 2° outcomes: Pain intensity; Occupational disability; persistence of pain; other	N=275, randomized to four treatment groups with 1:1:1:1 allocation. 3 Acupuncture (True, Sham & Placebo) groups blinded except Conventional Treatment alone. 210 completed 48 weeks follow up. IC: (1) New onset of nonspecific low back pain (2) no prior acupuncture (3) 18-65 years (4) Sign informed consent. EC: (1) specific/ complicated pathology of low back pain (2) 1 absence from work due to low back pain (3) takes anticoagulants	1° (Clinically Relevant Improvement in low back pain) shown as >35% improvement on the 24-point RMDQ 2° A. Pain intensity measured using Visual Analog Scale 0-100 mm. B. Occupational satisfaction assessed using a 7-point Likert scale. C. Fear and avoidance of Low back pain evaluated using Fear Avoidance Beliefs Questionnaire. Adverse effects such as epigastralgias / nausea with medication and increased pain post	1° outcome: Clinically relevant improvement of >35% on baseline RMDQ; however, differences between Acupuncture with Conventional treatment and Conventional Treatment alone were statically significant (*P*=.001). 2° outcomes: A. Pain intensity showed statistically significant difference among 4 groups. True Acupuncture group showed greater decrease of pain by 53.1% as compared to conventional treatment alone of 27.9%. B. Occupational satisfaction showed a	acupuncture with conventional treatment yields better outcome as compared to conventional treatment alone. Limitations (No blinding between Conventional treatment alone with acupuncture; acupuncture groups received special attention 5 sessions in 2 weeks; known positive patient expectations on acupuncture) Acupuncture treatment may serve as an effective adjunctive treatment for patients with acute low back pain.

Purpose	Design & Key Variables	Sample & Setting	Measures	Results	Conclusions & Limitations
	psychological factors such as fear and avoidance of pain; collateral and adverse reactions from the treatment.	(4) pregnancy (5) refused to sign informed consent. Multi-center, 2-year study at 4 primary health care centers in Andalusia, Spain.	acupuncture assessed on all groups. Measured at baseline, 3, 12 48 weeks post treatment.	higher relative risk for efficacy in treatment group (True with 6.58; Sham with 5.72; Placebo with 3.92) with respect to the conventional treatment only. C. Fear avoidance to activity is lower among Sham group (17.8) as compared to Conventional group (19). About 4.4% had adverse reaction (nausea/epigastralgias) to medications and 3.9% had increased pain after acupuncture	

Note: 1° =primary; 2°=secondary; AMED=Allied and Complementary Medicine Database; CENTRAL=Cochrane Central Register of Controlled trials; CINAHL= Cumulative Index to Nursing and Allied Health literature; DV=dependent variable; EC=exclusion criteria; IAS=Integrative Acupoint Stimulation; IC=inclusion criteria; IV=independent variable; mg=milligram; NRS=numerical rating scale; PCA= Patient Controlled Analgesia; PRISMA= preferred reporting items for systematic reviews and meta-analyses; RCT=Randomized Controlled Trial; RMDQ=Roland Morris Disability Questionnaire; STAI=State Anxiety Inventory; TDQ=Taiwanese Depression Questionnaire; TEAS=transcutaneous electric acupoint stimulation; Tx=treatment; VAS=visual analog scale

Table 2

Mind-Body Therapies as NPI for Managing Postsurgical Spine Pain

Purpose	Design & Key Variables	Sample & Setting	Measures	Results	Conclusions & Limitations
To assess effectiveness of psychological treatments in managing postsurgical pain, using RCT studies. (Nicholls et al., 2018)	Systematic reviews of RCTs IV: Psychological tx (including CBT, ACT, or mindfulness) DV: Pain intensity, pain disability	MEDLINE, Medline-In-Process, Embase & Embase Classic, PsycInfo searched from 1806 to 2017. N=5 RCTs IC: RCT study; psychological intervention of CBT, ACT, or mindfulness; tx done prior to or 2 months postsurgery; >18 years; English language. EC: Secondary literature; non-peer-reviewed; conference proceedings; no outcome criteria assessment; nonsurgical pain; <18 years.	Pain intensity measured via NRS, VAS, McGill Pain Questionnaire & BPI Pain disability measured via ODI and CAS	4 RCTs showed significant pain reduction. 5 RCTs showed improvements in pain disability.	Psychological tx showed significant improvement in pain and disability. Limitations (most RCT showed CBT tx; heterogeneous sample) Psychological tx may serve as adjunct tx in managing postsurgical pain.
To examine the effects of 15-minute psychosocial interventions (Mindfulness, Hypnotic Suggestion & Psychoeducation) to	Three-arm, parallel-group Randomized Controlled Trial IV: Arm 1 &2: Single scripted 15-minute session for both	N= 244 Mindfulness (*n*=86), Hypnotic Suggestion (*n*=73), Psychoeducation (*n*=85).	1° (Pain intensity & unpleasantness) Numerical Rating Scale 0-10 2° (relaxation, anxiety, pleasant body sensations & desire for	1° results: Mind-body interventions significantly ↓ pain intensity (*P*=<0.001; Mindfulness=23% & Hypnotic Suggestion=29%) as compared to	Mindfulness & Hypnotic Suggestion interventions showed better 1° & 2° outcomes as compared to Psychoeducation.

Purpose	Design & Key Variables	Sample & Setting	Measures	Results	Conclusions & Limitations
hospitalized patients with acute pain. (Garland et al., 2017)	Mindfulness & Hypnotic Suggestion. Arm 3: Single nonscripted 15-minute Psychoeducation (Pain coping strategies) DV:1° outcomes (Pain intensity & unpleasantness) 2° outcomes (relaxation, anxiety, pleasant body sensations & desire for opioids)	IC: Inpatient 18+ years English speaking who reports intolerable or inadequate pain control EC: altered mental status, no/↓ pain, declined, discharge, unavailable due to medical procedure & non-English speaking Single-site, 1-yr study conducted at Hosp. in Salt Lake City	opioids) Numerical Rating Scale 0-10. Morphine Equivalent Daily Dose calculates opioid dose in past 24 hours prior to intervention.	Psychoeducation (*P*=0.009 at 9%). ↓ pain unpleasantness on Mindfulness & Hypnotic Suggestion group. 2° results: Mindfulness & Hypnotic Suggestion differed significantly on 2° outcomes except anxiety (seen on 3 groups). No Morphine Equivalent Daily Dose changes on Mindfulness & Hypnotic Suggestion.	Limitations include (no follow up data; Mindfulness & Hypnotic Suggestion have overlapping instructions; Psychoeducation did not control for effects of mind-body interventions; Hypnotic Suggestion not delivered by hypnotherapists). Mind-body interventions (Mindfulness & Hypnotic Suggestion) may still serve as an effective adjunct to pain management
To evaluate the effectiveness of preoperative mind-body therapies on postoperative outcome measures. (Nelson et al., 2013)	Systematic review using PRISMA guidelines. IV: Mind-body tx (relaxation, guided imagery, hypnotic tx) given preoperatively DV: Postoperative outcomes (Anxiety, pain, analgesic use, vital signs, length of stay)	Electronic databases of MEDLINE, CINAHL, &PsycInfo searched up to 2012. N= 20 studies included (1297 patients) IC: RCTs or quasi-RCTs; English; >16 years; pts underwent surgery; prospective before-after surgery design; outcome measures (psychosocial measures anxiety,	Pain scores assessed via NRS, VAS Vital signs (BP, HR, RR) Anxiety (STAI) Length of hospital stay from admission to discharge	Guided imagery showed effective in reducing postoperative pain levels. Guided imagery, hypnosis and relaxation showed marginal improvement in postoperative anxiety level and pain perception. Half of the studies showed vital signs improvement.	Mind-body therapies showed some improvement in postoperative outcomes (e.g. pain, anxiety, vital signs) Limitations (English only; most RCT have small sample size, some RCT studies unable to show sufficient randomization details; heterogeneous sample)

Purpose	Design & Key Variables	Sample & Setting	Measures	Results	Conclusions & Limitations
		depression); assessment of outcome measures pre-postsurgery; control group. EC: Intervention solely on pharmacotherapy, counseling, education; mind-body tx combined with pharmacotherapy; family participation; day procedure; surgical procedure only with local anesthetic; postoperative only design.			Although further study is necessary, Mind-body treatment may serve as adjunctive tx in managing postsurgical pain.

Note: ACT=Acceptance and Commitment Therapy; BP=blood pressure; BPI=Brief Pain Inventory; CAM=Complementary & Alternative Medical; dept=department; CAS= Cumulated Ambulation Score; CBT=Cognitive Behavioral Therapy; CPSES=Chronic Pain Self-efficacy scale; DN4=Douleur neuropathique 4 questionnaire; DV=dependent variable; EC=exclusion criteria; EMG=electromyogram; HADS=Hospital Anxiety and Depression Scale; HCAHPS=Hospital Consumer Assessment of Healthcare Providers and Systems; IC=inclusion criteria; IV=independent variable; ODI= Oswestry Disability Index; PASS-20= Pain Anxiety Symptoms Scale-20 item; PCS= pain catastrophizing scale; PT=physiotherapy; RCT=Randomized Controlled Trial;; RMDQ=Roland Morris Disability Questionnaire

Table 3

Music Therapy as NPI for Managing Postsurgical Spine Pain

Purpose	Design & Key Variables	Sample & Setting	Measures	Results	Conclusions & Limitations
To evaluate the effects of music therapy on postsurgical spine pain and comfort. (Mondanaro et al., 2017)	Mixed-method design IV: Music therapy group (30-minute 1 session w/in 72 hours after surgery + standard of care). Control group (standard of care) DV: 1° = pain scores 2° = Anxiety and depression, patient's perception of fear-related movement, and pain experience.	N=60 randomized to 30 each group. IC: Pt who underwent anterior, posterior, antero-posterior spinal fusion; signed consent. EC: Dx with clinical psychosis or depression prior to spine surgery Study done at Dept of Orthopedic Surgery at Spine Institute of New York.	1° outcome Pain Scores assessed via VAS score (before and after intervention) 2° outcomes (before and after intervention) A. Anxiety and depression via HADS scale B. Pt perception of fear-related movement via TSK. C. Pain experience illustrated via CAS.	1° outcome Pain Scores showed statistically significant improvement post music therapy (p=0.01) 2° outcomes No difference in HADS & TSK on both groups.	Music therapy showed significant decrease in pain scores. Limitations (small number of participants; Narrow treatment window; one session only) Music therapy can be an adjunct tx in managing postsurgical spine pain.
To evaluate Music therapy's effectiveness in postsurgical thoracic pain, anxiety and vital signs. (Liu & Petrini, 2015)	RCT design IV: Intervention group (30-min music tx for 3 days + standard of care). Control group (Standard of care). DV: 1.Pain score 2. Anxiety level 3.Vital signs (BP, HR and RR. Opioid use	N=112 randomized to 56 each group. IC: Pts for thoracic surgery; >18 years; Chinese literate; alert and orientedx4. EC: Vision or hearing deficits; not willing to participate; inability to complete questionnaires; emergency surgeries.	All measures assessed from baseline, postoperative day 1, 2 and 3. Pain score measured using faces pain scale. Anxiety level assessed using STAI scale. Measurement of vital signs not specified. Opioid use calculated via PCA usage. DSS	There is a significant difference in pain scores (p=0.019) favoring music therapy. Music therapy also shows significant decrease in anxiety, SBP and HR. No difference seen in RR, DBP, DSS and PCA use.	Music therapy showed pain improvement, less anxiety and stable vital sings. Limitations (music choice limited to researchers chosen music; intervention group received added attention; limited days of treatment) Music therapy may serve as adjuvant

Purpose	Design & Key Variables	Sample & Setting	Measures	Results	Conclusions & Limitations
		5-month study done at two tertiary hospitals in Wuhan, China.	consumption also measured in mg.		treatment in managing postsurgical pain.
To assess effectiveness of Music therapy in postoperative recovery, using all RCTs. (Hole et al., 2015).	Systematic Review and Meta-analysis. IV: music therapy DV: Outcome measures for postoperative care (Pain, Analgesia use, anxiety, length of stay). Subgroup outcomes (pt choice of music, timing of intervention, general anesthesia use or not).	Electronic databases of MEDLINE, Embase, CINAHL, and Cochrane Central searched from 1898-2013. N=73 RCTs included (6902 patients) IC: RCT; any language; adult pt having surgery (w/ or w/o sedation/anesthesia; music therapy initiated before, during or after surgery; outcomes (pain, analgesia needs, anxiety, infection rates, length of stay, satisfaction). EC: Central nervous system or head/neck surgery; non-RCT; no music therapy; control given music tx; Systematic reviews; combined interventions or outcomes.	Pain measure via VAS or NRS. Analgesia use (opioid or nonopioid) assessed as indirect pain measures. Anxiety measured by STAI. Length of stay from admission to discharge.	Music therapy reduced postoperative pain (45 RCT), anxiety (43 RCT), analgesia use (34 RCT) and improve satisfaction (16 RCT). Music therapy shows no effect on length of stay (7 RCTs). Marginal (but not significant) decrease in pain scores when pt choose their own music. Timing of music therapy showed better pain control, anxiety and less analgesia use when given preoperatively.	Music therapy showed improvement in pain, anxiety, satisfaction and analgesia use. Limitations (wide inclusion criteria; heterogeneous sample; older studies included) Music therapy can be a noninvasive and safe adjunct tx in managing postsurgical pain.
To review the current evidence on music therapy's effectiveness	Systematic Review IV: music therapy	Electronic databases of MEDLINE, Scopus, CINAHL, Cochrane,	Pain scores assessed via VAS, NRS, McGill Pain Questionnaire.	13 RCTs showed statistically significant pain reduction.	Music therapy showed significant pain, vital

Purpose	Design & Key Variables	Sample & Setting	Measures	Results	Conclusions & Limitations
as adjuvant tx on controlling pain in hospitalized patients. (Cole & LoBiondo-Wood, 2014)	DV: Pain and other symptoms (medication use, vital signs and anxiety level)	and Natural Standard Databases searched from 2005 to 2011. N=17 RCT (1937 patients) IC: RCT; inpatient setting/hospitalized pts; English only; adult patients. EC: nonhospitalized; non-English studies; non-RCTs; no music therapy.	Vital signs measured (BP, HR, RR and oxygen saturation) Opioid use measured using oral morphine conversion. Anxiety level measured via Muscle tension inventory scale, NRS, faces anxiety scale, STAI,	5 RCT showed improvement in patient's vital signs. 2 RCT showed statistically significant decrease in analgesia use. 5 RCT showed significant anxiety reduction.	signs and anxiety improvement. Limitations (Only 7 RCTs are surgical patients; heterogeneous samples) Music therapy can be an effective adjunct tx in managing acute pain.
To determine music therapy's effectivness as adjunct tx in managing postoperative pain management, anxiety and environmental noise satisfaction. (Comeaux & Steele-Moses, 2013)	Quasi-experimental nonequivalent control group design IV: Intervention group (3-day music tx 30 mins after analgesia + standard of care). Control group (standard of care). DV: Pain management, anxiety and environmental noise satisfaction.	N=41 IC: Anticipated 3- day admission; alert and oriented; >18 years; English literate; hematology and oncology diagnosis. EC: <3-day admission, <18, non-English literate. Study done at 27-bed inpatient surgical unit at Our Lady of Lake Regional Medical Center, Baton Rouge, LA.	Pain, anxiety and Environmental noise satisfaction assessed via STAI and two-standardized questions from Press-Ganey Survery.	Statistically significant improvement pain management and noise satisfaction among music therapy group seen over time ($p<0.001$). No change on state anxiety seen.	Music therapy is effective in improving pain management and noise reduction. Limitations (weaker design; control group pt are listening to music on their own; small sample size; limited tx time) Music therapy can serve as adjunct tx in managing acute pain.

Note: 1° =primary; 2°=secondary; BP=blood pressure; CAS=Color Analysis Scale; CPSES=Chronic Pain Self-efficacy scale; DBP= Diastolic Blood pressure; DSS=Diclofenac Sodium suppository; DV=dependent variable; EC=exclusion criteria; HADS=Hospital Anxiety and Depression Scale; HCAHPS=Hospital Consumer Assessment of Healthcare Providers and Systems; HR=heart rate; IC=inclusion criteria; IV=independent variable; mg=milligram; mm=millimeter; NRS=numerical rating scale; PASS-20= Pain Anxiety Symptoms Scale-20 item; PCA=Patient Controlled Analgesia; PCS= pain catastrophizing scale; PT=physiotherapy; RCT=Randomized Controlled Trial; RMDQ=Roland Morris Disability Questionnaire; RR=respiratory rate; SBP=Systolic blood pressure; STAI=State Trait Anxiety Inventory; TSK= Tampa Scale of Kinesiophobia; tx=treatment; VAS=Visual Analog Scale

Table 4

Heat/Cold Therapy as NPI for Managing Postsurgical Spine Pain

Purpose	Design & Key Variables	Sample & Setting	Measures	Results	Conclusions & Limitations
To determine the effectivness of cold therapy on postsurgical spine fusion pain and analgesia use. (Quinlan et al., 2017)	RCT design IV: Intervention group (Repositioning and Cold tx for 20 mins). Control group (Repositioning only) DV: 1° outcome=Pain Score 2°outcome= Analgesia use and perceived benefit of cold therapy	N=148 randomly assigned to cold therapy intervention or control group. Dropout rate of 22%. IC: Pt spine fusion surgery; English speaking; > 18 years EC: non-English speaking; cold intolerance; hx of RA, scleroderma, Reynaud's, dementia; prior cold tx use before back surgery. Post op EC (prolonged PACU stay, additional surgery). Study done at inpatient surgical unit, USA	1° outcome =Pain scores assessed using NRS 11-point scale (before and after tx). Total of 12 pain check. 2° outcome= Analgesia use converted to oral morphine equivalent ratio. Perception of benefit evaluated using a single item, yes or no with the question "Did the intervention help to reduce your pain"?	Marginal pain reduction seen in intervention group across all 12 pain checks. Not statistically significantly different with control group. Intervention group used less analgesia than control group (p=0.042). No different perception of pain due to intervention between groups.	Cold therapy showed marginal pain reduction and statistically significant analgesia use. Limitations (Larger sample size is preferable; only specific to one surgical unit) Further studies are necessary but cold therapy can be an adjunctive tx for postsurgical spine pain.
To evaluate the effect of self-administered hot/cold applications on pain, functional status and quality of life on patients with primary knee OA.	RCT design IV: Two Intervention group (Hot application & Cold application group) hot/cold tx 20 mins 2 x/day for 3 weeks + standard tx.	N=96 (32 on each 3 group) Hot application group, cold application group and control group. IC: New dx primary knee OA based on ACR and Kellgren-	Pain Score assessed using VAS (baseline, after tx and 2 weeks after tx) Functional status assessed using WOMAC index with 5 likert scale.	Statistically significant decrease of pain scores (pre-post implementation) at rest, movement and sleep among hot and cold intervention group, but not significantly	Hot/Cold therapy showed minimal improvements in pain, functional status and quality of life. Limitations (hot/cold tx taught to the patients

Purpose	Design & Key Variables	Sample & Setting	Measures	Results	Conclusions & Limitations
(Aciksoz, Akyuz, & Tunay, 2017)	Control group (Standard orthopedic tx). DV: 1.Pain Score 2.Functional status 3.Quality of Life	Lawren criteria; able to implement Tx regularly; able to receive standard OA Tx; 40-80 years old; normal blood test; literate; Ankara residents; participate voluntarily. EC: Dx w/ inflammatory joint disease; hx of knee surgery w/in 6 months; skin lesion; arterial/venous disorder; hot/cold allergies; neurological disease, receive standard Tx other than OA Tx. 11-month study done at Orthopedics and Traumatology Outpatient Dept of Gulhane Military Medical Education and Research Hospital in Ankara, Turkey	Quality of Life assessed using NHP health status scale.	different from control group. WOMAC scores shows statistically significant difference from pre-post among two intervention group (P<0.05). NHP scores showed improvement among two intervention groups but not statistically different from control group.	but actual observation not done) Further research is necessary; however, Hot/Cold therapy may serve as adjunctive tx in managing pain.
To assess the effectiveness of superficial heat as adjunct therapy to exercise program in patients with distal end radius fractures.	Prospective Clinical Trial design IV: Intervention group (10 sessions--15 minutes each with superficial	N=18 participants divided into two groups via randomization. IC: Patients with distal end radius fracture manage with close	Pain assessed using VAS (before and 3 weeks after treatment) ROM using Goniometer and PRWE.	Intervention group showed greater pain reduction compared to control (p<0.05). Intervention group showed ROM	Heat therapy showed significant pain reduction and ROM improvement. Limitation (small sample; effect on

Purpose	Design & Key Variables	Sample & Setting	Measures	Results	Conclusions & Limitations
(Y, S, & A, 2015).	heat followed by therapeutic exercises). Control group (therapeutic exercise only) DV: 1.Pain Scores 2.ROM of wrist and radio-ulnar joints	reduction 4-6 weeks; PT referral. EC: Patients who underwent surgery; hx of other fracture; CRPS; Neurological or musculoskeletal disorder; vascular disorders, open wounds, fever, HTN. Study done at physical therapy OPD of K.E.M. hospital, Mumbai.		improvement on wrist flexion and extension ($p<0.05$) but not on pronation and supination. PRWE score showed improvement in both groups. Treatment group showed statistically significant PRWE improvement ($p<0.05$).	dominant hand not evaluated) Heat therapy may serve as adjunct treatment to acute pain.
To (1) Assess effects of superficial heat therapy on both Paraspinal Muscle Activity and Stature Recovery on patients with chronic low back pain. (2) Assess whether heat therapy had any short-term effect on pts' psychological factors. (Lewis et al., 2012)	Repeated measures design. IV: Superficial Heat therapy DV: 1. Paraspinal Muscle Activity assessed via EMG; Stature Recovery assessed via Stadiometer 2. Pain intensity via Numerical Rating Scale 3. Psychological factors (Disability, anxiety and depression, functional self-efficacy, fear of movement, catastrophizing, pain-related anxiety).	*N*=24, 15 completed, dropout rate of 7=37.5% IC: (1) Chronic low back pain patients (waitlist/attending at rehab programs; yellow flag risk factors) (2) asymptomatic patients (no recurrent or persistent back pain) EC: (1) chronic low back pain patients (Nerve Root Compression; Central Nervous System impairment; Progressive Motor Deficit; Sphincter Impairment; red flags)	Both Paraspinal Muscle Activity (via EMG) & Stature Recovery (via Stadiometer) assessed at rest, during Reference Voluntary Contraction and post 40-min unloading period. Pain intensity measured using Numerical Rating Scale ranging from 0-10. Psychological factors measured using self-report tools; Disability using RMDQ 24-item tool; Anxiety & Depression using HADS; Functional self-	Paraspinal Muscle Activity was not significantly different on % of Reference Voluntary Contraction between 2 sessions of heat therapy. Nonnormalized paraspinal muscle activity nonsignificant. ↓(P=<0.01) even when patients with ↑ pain included. Stature Recovery was not significantly different with heat therapy. Numerical Rating Scale showed higher pain ratings of at least 3/10 while wearing heat	Use of superficial heat therapy showed a positive decrease in muscle activity on patients with chronic low back pain. Additionally, heat therapy showed a positive short-term psychological effect on patients. Limitations (use of analgesics; reliability of self-report measures) Further studies are necessary; however, heat therapy may serve as adjunct treatment for chronic low back pain.

Purpose	Design & Key Variables	Sample & Setting	Measures	Results	Conclusions & Limitations
		(2) patients with recurring low back pain, had low back pain within the last 15 years). Single-site, PT dept. at a Hospital in Manchester, UK.	efficacy using functional subscale of CPSES; Fear of movement using TSK; Catastrophizing using PCS; Pain-related anxiety using PASS-20.	wrap. Excluded patients have pain level of 3 or more difference in 2 visits Stature Recovery were significantly correlated with changes in Nonnormalized Paraspinal Muscle Activity, disability, catastrophizing, pain and fear of movement.	

Note: 1° =primary; 2°=secondary; CPSES=Chronic Pain Self-efficacy scale; CRPS=Complex Regional Pain Syndrome; DV=dependent variable; dx=diagnosed; EC=exclusion criteria; EMG=electromyogram; HADS=Hospital Anxiety and Depression Scale; HCAHPS=Hospital Consumer Assessment of Healthcare Providers and Systems; HTN=hypertension; hx=history; IC=inclusion criteria; IV=independent variable; NHP=Nottingham health profile; NRS=Numerical Rating Scale; OA=Osteoarthritis; PACU=Post Anesthesia Care Unit; PASS-20= Pain Anxiety Symptoms Scale-20 item; PCS= pain catastrophizing scale; PRWE=Patient Rated Wrist Evaluation Scale; PT=physiotherapy; RA=Rheumatoid Arthtitis; RCT=Randomized Controlled Trial; ROM=Range of Motion;RMDQ=Roland Morris Disability Questionnaire; TSK= Tampa Scale of Kinesiophobia; tx=treatment; UK=United Kingdom; VAS=Visual Analog Scale; WOMAC=Western Ontario and McMaster Universities Osteoarthritis Index.

Table 5

Animal-Based/Pet Therapy as NPI for Managing Postsurgical Spine Pain

Purpose	Design & Key Variables	Sample & Setting	Measures	Results	Conclusions & Limitations
To assess the effectiveness of animal-assisted therapy (Therapy dogs) on postoperative (THA and TKA) patients in relation to their pain perception and hospital stay satisfaction. (Harper et al., 2014)	RCT design IV: (1) Treatment group (Three 15-minute visitation from a therapy dog 30 minutes prior to physical therapy) (2) Control group (Physical therapy per hospital protocol, normal hospital routine) DV: (1) Pain intensity levels measured via Visual Analog Scale measured on postoperative Days 1 and 2 (2) Patients satisfaction of hospital stay via HCAHPS score acquired at time of discharge.	N=72 randomized to either treatment or control group. IC: (1) >18 years (2) postoperative unilateral TKA or THA (3) English literacy (4) Sign Informed Consent. EC: (1) Afraid of dogs (2) Dog allergy (3) Immunosuppressed (4) undergoing chemotherapy (5) Delirium (6) Discharged on Day 1 (7) Same room patients on Treatment and Control group; roommate who objected. Single-site, 2-month study done tertiary care hospital	Pain intensity assessed using Visual Scale Analog (Immediately after 1st, 2nd & 3rd physical therapy & prior to analgesic medications). HCAHPS score (At time of discharge)	Treatment group showed statistically significant decrease in Visual Analog Scale pain scores as compared to Control group. (*P*=<.001 on all three sessions). HCAHPS score showed significant satisfaction in treatment group (Nursing Communication *P*=0.03 & Pain management *P*=0.02) as compared to control group.	Animal-assisted therapy showed improved pain intensity and HCAHPS score on postoperative patients who undergone TKA and THA. Limitations: (No blinding; Only one dog and one handler; possible variability of patient's response to different dogs/handlers; dose and timing of analgesic administration not controlled). It is safe to say that animal-assisted therapy dogs are effective adjunct therapy for some orthopedic postoperative pain control.
To evaluate the effectivness of brief animal-assisted therapy to patients/families/staff	Open-label design IV: Therapy dog visits (interaction with the	N= 295 dog therapy (235 patients, 24 family/friends, 26 staff), N=96 waiting room control	10 Symptom factors assessed via 11-point NRS (before and after visit for both groups)	Significant improvement on all 10 symptom factors post therapy dog group (patient and family)	Brief Animal-assisted therapy showed improvement in patient's pain/emotional distress.

Purpose	Design & Key Variables	Sample & Setting	Measures	Results	Conclusions & Limitations
in an outpatient pain routine visits. (Marcus et al., 2012)	therapy dog prior to routine visit); Control group (usual waiting room environment) DV: 10 Symptom factors (Pain, Fatigue, Stress, Aggravation, Anxiety, Sadness, Irritability, Calm, Pleasant, & Cheerful). Mood (depression) and Generalized anxiety level (baseline)	IC: >18 years old who are willing to participate. EC: none Two-month study done at outpatient, tertiary care, interdisciplinary pain clinic.	Mood assessed via PHQ-4 and anxiety level assessed via GAD-2 (baseline only)	Clinical reduction of pain is 22.6% (Therapy group) vs 3.6% (waiting control group). >pain relief with dog visits >10 minutes (24.8%). Baseline GAD for therapy group is higher 40% vs control group 27.7%.	Limitation (weak design; no blinding; single dog therapy; postsurvey completion done in a different day; one treatment only) Animal-assisted therapy may serve as an adjunct treatment for chronic pain.

Note: DV=dependent variable; EC=exclusion criteria; GAD-2= General Anxiety Disorder; HCAHPS=Hospital Consumer Assessment of Healthcare Providers and Systems; IC=inclusion criteria; IV=independent variable; NRS=numerical rating scale; PHQ-4= Patient health Questionnaire; RCT=Randomized Controlled Trial; THA=Total Hip Arthroplasty; TKA=Total Knee Arthroplasty.

Table 6

Virtual Reality as NPI for Managing Postsurgical Spine Pain

Purpose	Design & Key Variables	Sample & Setting	Measures	Results	Conclusions & Limitations
To measure the impact of 3D VR distraction experience versus 2D high-definition distraction video in hospitalized patients' pain (Tashjian et al., 2017)	Nonrandomized comparative cohort study IV: Pain RelieVR 15-minute VR experience called and 15-minute nature video via 2D 14-inch high-definition screen DV: Pain	N=500, Pain RelieVR (*n*=50), 2D high-definition video (*n*=50). IC: Hospitalized, 18+ years, pain score of -≥3/10 Numerical Rating Scale EC: Patients who cannot consent; in contact isolation; with head wounds/bandages; history of vertigo; seizure; epilepsy; nausea and vomiting. Single-site, 6-month study done at Cedars-Sinai Medical Center.	Pain scores quantified using a standard 11-point Numerical Rating Scale. Pain assessed pre-post (2 minutes) intervention using a 11-point Numerical Rating Scale, ranging from 0 (no pain) to 10 (worst pain). Heart Rate and Blood Pressure measured in VR group. Potential adverse effects such as dizziness, vertigo, nausea/vomiting & seizures were also evaluated for this group.	Pain reduction was greater in Virtual Reality cohort (↓24%) compared to control (↓13.2%). No significant differences in Blood Pressure or Heart Rate between pre-post VR. No adverse events reported in VR group.	VR intervention showed a greater reduction of pain scores as compared to control group. Further research is necessary in larger population; administer VR in longer duration; assessed opioid use by measuring MEDD; assess LOS; post discharge outcomes & assess VR's cost-effectiveness VR may serve as an effective adjunct nonpharmacologic intervention for managing pain.
To assess patient perspectives regarding VR-based rehabilitation post knee surgery. (Minyoung et al., 2016)	Mixed-methods approach (qualitative and quantitative) IV: 8 sessions (2.5 minutes each) Total of 30 minutes of VR-based exercise DV:	N=35 IC: Patients 4 weeks post knee surgery, stand independently, normal MMSE score >25. EC: Hx of epilepsy or pacemaker use.	1.Pretreatment A. Pain scores quantified using a 11-point Numerical Rating Scale. B. Physical dysfunction assessed using (Lower Extremity Functional Scale; Activity-Specific Balance Confidence	Pretreatment shows pain mean score of 3.04/10. No significant correlation between FSS-2 scores to pain severity and physical dysfunction.	VR-based rehabilitation program showed high "flow experience" for post-knee surgical patients. Important to modify VR exercise's level of difficulty. Limitations (Small participants; FSS-2

Purpose	Design & Key Variables	Sample & Setting	Measures	Results	Conclusions & Limitations
	1.Pretreatment assessment (Pain score and physical dysfunction) 2.Posttreatment assessment (Patient's flow experience)	Study done at Join rehabilitation center in Barunsesang Hospital, Seongnam, South Korea.	Scale; Single-Leg Stance; Hip and Knee ROM; Hip and Knee Muscle strength) 2. posttreatment A. Flow experience assessed via FSS-2 and KUUEQ	Individually, FSS-2 showed sharper pain & hip-flexion angle causes clear goal recognition. Total FSS-2 score significantly higher than the norm value (*p*<0.001). High level of flow experience 3.9/5. Flow experience via KUUEQ high expectation of therapeutic effect (96%). Intention of exercise adherence (96%).	comparison to norm values were not post-knee surgical patients) VR may serve as an effective adjuvant to pain and can foster increase mobilization.
To assess VR's effectiveness as a distraction pain tool for patients undergoing hand dressing change. (Guo, Deng, & Yang, 2014)	RCT design IV: Intervention group (VR 3D movies for 5 minutes before end of dressing change). Control group (ask to close eyes or "conventional dressing repose") DV: Pain scores, anxiety levels and sense of involvement	N=98 randomly divided into experimental and control group (49 each) IC: Serious hand injuries; debridement or suturing w/in 72 hours of injury; 18 years or older; able to complete the scale and volunteer for the research. EC: Use of analgesics/interventions w/in 72 hours after injury; <3 dressing changes; visual acuity	Pain scores assessed via VAS scores (w/in 5 minutes before and after dressing changes). Anxiety levels assessed before dressing change via STAI. Sense of involvement (VR group only) assessed using the Chinese version of commitment questionnaire (19- 133 score, the > score =	VR group shows significant VAS score reduction compared to control group (From 6.49 to 2.63, *p=<0.05)*. STAI shows two groups' anxiety level are comparable. VR group showed the higher commitment to VR space = increase pain control effect.	VR as a distraction tool shows significant reduction of pain. Limitation (Variation in VR movies limited to one; VR movie only given on the last 5 minutes before and not during the entire dressing change). VR may serve as an effective adjunct nonpharmacologic intervention for managing pain.

Purpose	Design & Key Variables	Sample & Setting	Measures	Results	Conclusions & Limitations
		<1.0; hearing disorders, <8 cognitive ability. 11-month study done at outpatient surgical treatment facility in China.	stronger sense or user input).		

Note: 2D=two-dimensional; 3D=three-dimensional; DV=dependent variable; EC=exclusion criteria; FFS-2= Flow State Scale 2; HCAHPS=Hospital Consumer Assessment of Healthcare Providers and Systems; Hx=history; IC=inclusion criteria; IV=independent variable; mm=millimeter; KUUEQ= Korea University User Experience Question; LOS=length of stay; MEDD=Morphine Equivalent Daily Dose; MMSE=Mini-Mental State Examination; MP3=media player; PCS= pain catastrophizing scale; PT=physiotherapy; RCT=Randomized Controlled Trial; ROM=Range of Motion; STAI=State Trait Anxiety Inventory; VAS=Visual Analog Scale; VR=Virtual Reality

APPENDIX C

CSULB IRB APPROVAL

CALIFORNIA STATE UNIVERSITY, LONG BEACH

OFFICE OF RESEARCH & SPONSORED PROGRAMS

DATE:	December 13, 2018
TO:	Chona Melvin, MSN,NP
FROM:	CSULB IRB
PROJECT TITLE:	[1345966-2] Using comfort menu to impact pain experience
REFERENCE #:	19-159
SUBMISSION TYPE:	New Project
REVIEW TYPE:	Administrative Review
ACTION:	APPROVED
APPROVAL DATE:	December 13, 2018

This is to advise you that the Institutional Review Board for the Protection of Human Subjects (IRB) of California State University, Long Beach, has reviewed your protocol application.

Your application is approved by Administrative Review according to the U.S. Department of Health & Human Services regulation at 45 CFR 46. 101 (b)(4).

Approval is effective beginning December 13, 2018 and conditional upon your willingness to carry out your continuing responsibilities under University policy:

1. You must clearly indicate in the header or footer of each page of your approved Informed Consent Form and recruitment material as follows: "**Approved December 13, 2018 by the CSULB IRB**."
2. If you need to make changes/revisions to this approved project, you must submit a Request for Amendment to an Approved Protocol form in addition to any documents affected by the requested change. Submit these documents as a subsequent package to your approved project in IRBNet. You are not allowed to implement any changes to your research activities prior to obtaining final approval of your Amendment from the CSULB IRB.
3. You are required to inform the Director of Research Integrity and Compliance, Office of Research & Sponsored Programs, via email at ORSPCompliance within twenty-four hours of any adverse event in the conduct of research involving human subjects. The report shall include the nature of the adverse event, the names of the persons affected, the extent of the injury or breach of confidentiality or data security, if any, and any other information material to the situation.
4. Maintain your research records as detailed in the protocol.
5. Respond to the Annual Check-In notice via IRBNet if you intend to continue the project after December 12, 2019.

APPENDIX D

CSMC IRB APPROVAL

Date: 11/1/2018 9:19 AM
To: BERNICE COLEMAN
CC:
From: ***Rebecca Flores Stella, CIP***
Manager, IRB Operations & Education
CSMC Office of Research Compliance
Re: **Required Regulatory Review for Proposed Research Activity**
Pro00055312
Using comfort menu to impact pain experience

Based on the information in the above referenced application, the Cedars-Sinai Office of Research Compliance and Quality Improvement has determined:

The proposed activity does not involve human subjects research. While the activity described in your proposal does involve research, it does not meet the definition of "human subject research" as defined in the DHHS (45 CFR 46) or FDA regulations (21 CFR 50) for the protection of human subjects. The above activity does not require approval from the CSMC IRB or certification of exemption from the requirement for IRB approval.

- DHHS regulations for the protection of human subjects (45 CFR 46) are available at http://www.hhs.gov/ohrp/humansubjects/guidance/45cfr46.htm
- FDA regulations for the protection of human subjects (21 CFR 50) are available at http://www.fda.gov/oc/ohrt/irbs/appendixb.html

Based on the above summary the use of materials in this proposed research meets the definition of "acceptably derived."

Should the proposed use of materials change, an amendment will be required to reconfirm the required level of regulatory oversight.

Please feel free to contact me at (310) 423-3783 with any questions or concerns.

APPENDIX E

COMFORT MENU FOR PATIENTS

IMPROVING YOUR PAIN

Comfort Items and Services Menu

ACUPUNCTURE

Acupuncture is an alternative therapy that helps relieve pain by putting thin needles into the body.

Acupuncturists can help you with your pain. Treatments are done in your own room.

*Please ask your nurse if you are eligible for this treatment.

PET (POOCH) THERAPY

Our friendly, trained dogs of all sizes can visit you in your room. Many people find comfort from the warmth and unconditional love that dogs can offer.

HOT/COLD THERAPY

Your nursing team can use hot or cold packs to help relieve your pain.

VIRTUAL REALITY

Virtual reality goggles transport you to another world and help take your mind off any discomfort.

*Please ask your nurse if you are eligible for this treatment.

MUSIC THERAPY

Listening to music can ease your pain. We can help you tune into a music channel on your TV. We also have music volunteers who can play music and sing for you in your room, depending on availability.

REIKI AND MEDITATION

Our Spiritual Care Department offers healing reiki or guided meditation sessions in your room.

WANT TO TRY ANY OF OUR SERVICES?

If you are in pain, talk to your care team about trying any of our alternative therapies.

Your comfort is important to us, and we have many ways to help you feel better.

Note: Comfort Menu for patients. Adapted from “Improving Your Pain Comfort Items and Services Menu”, Cedars-Sinai 2018. Copyright 2018 by Cedars-Sinai. Reprinted with permission.

APPENDIX F

COMFORT MENU INSTRUCTIONAL GUIDE FOR NURSING STAFF

<u>ACUPUNCTURE</u>

- Performed in-house an appointment basis only
- **NEED PHYSICIAN ORDER**
  - Enter as Nursing Communication
  - "OK for Acupuncture
  - Telephone Order

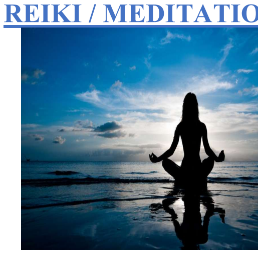
<u>VIRTUAL REALITY</u>

- No physician order needed
- Readily available during day shift
- **CONTRAINDICATIONS**: **cervical patients, n/v, seizures, contact isolation, etc.**
- 2 will be available for use on the unit – locked in Med Room. please fill out log book

<u>PET THERAPY</u>

- Available between 9AM – 4PM ***if a pet volunteer is available that day***
  (i.e. may not be available every day)
- Prioritized by call, so **CALL EARLY**

<u>REIKI / MEDITATION</u>



- **<u>AVAILABILITY:</u>** by appointment only
- **NEED TO ENTER ORDER (Scope of Practice)**
  - Enter order for "CONSULT TO SPIRITUAL CARE"
  - Click to add text: "Reiki"
  - Scope of practice
- Call Spiritual Care office

<u>HOT/ COLD ITEMS</u>

- **<u>DO NOT PLACE directly on incision site</u>**
- **<u>Hot/Cold packs</u>** readily available in supply closet/med room
- Call central issues when out of stock

<u>MUSIC THERAPY</u>

- Readily available on TV Channels:

12- Relaxation Channel	**91** – adult contemporary
90 – classic rock	**92** – lite classical
	93 – white noise

- Headphones provided in admission kit from volunteer services
- Available between 9AM – 4PM ***if a musician volunteer is available that day***
  (i.e. may not be available every day)
- Prioritized by call, so **CALL EARLY**

(Source: Prepared by Chona C. Melvin.)

APPENDIX G

CSMC CLEARANCE TO DISSEMINATE AND PUBLISH

Requesting Department: Medical / Surgical
Document is a/an: Abstract
Document Title: Using Comfort Menu to Impact Pain Experience
Document will be submitted to: Southern California CSU DNP Consortium

Institutional Review and Approval:
I am not an author on the above named manuscript. I have reviewed the above titled manuscript, and accept as valid the scientific or biomedical information presented. In addition, I have reviewed this form and to the best of my knowledge accept as valid the identification of the authors.

Approver's Signature: Norma Ullman PhD ACNP BC FAHA FAAN

APPENDIX H

DATA EXTRACTION TOOL

Demographic
Case #
Age
Gender
Current type and level of Spine Surgery
Previous Spine Surgery
Baseline MEDD

(Source: Prepared by Chona C. Melvin.)

APPENDIX I

PRIMARY OUTCOME EXTRACTION TOOL

Case#	
Primary Outcomes	
POD# 24-hour Mean NRS pain level	
POD# 24-hour MEDD use (Based on MEDD calculation Appendix J)	
$MEDD_n$= (Baseline MEDD – 24-hour MEDD use)	
POD# when NPI was use	
Number of NPI used on entire LOS	
Specific NPI used on entire LOS	

(Source: Prepared by Chona C. Melvin.)

APPENDIX J

MORPHINE EQUIVALENT DAILY DOSE CALCULATION

Opioid (Generic/Trade Name)	**Daily Dose**	**Oral Morphine Equivalent md/day conversion**
Codeine		
Fentanyl		
Hydrocodone		
Hydromorphone		
Methadone		
Morphine		
Oxycodone		
		SUM morphine equivalent daily dose (MEDD)

Note. Adapted from the Opioid Prescribing guidelines and Equianalgesic Chart (American Pain Society, 2016)

APPENDIX K

POSTIMPLEMENTATION SURVEY QUESTIONNAIRES FOR NURSING STAFF

1. Has any of your patient used non-pharmacological pain treatment in the comfort menu? If yes, please check (all) that is most commonly requested by the patient:

    ___ Acupuncture

    ___ Pet therapy

    ___ Hot/cold therapy

    ___ Virtual Reality

    ___ Music therapy

    ___ Reiki/Meditation

2. Has any of your patients refused the use of the comfort menu? If yes, please indicate the reason for refusal:

    ____

    ____

3. Do you have any suggestions on how we can encourage our patients to utilize the NPIs from the comfort menu?

    ____

    ____

(Source: Prepared by Chona C. Melvin.)

APPENDIX L

EQUIANALGESIC CHART

Opioid Prescribing Guidelines and Equianalgesic Chart								
Generic (Brand)	Onset (O) and Duration (D)		Approximate Equianalgesic Dose		Recommended *STARTING* dose for ADULTS		Recommended *STARTING* dose for CHILDREN (> 6 mo)	
	Oral	IV	Oral	IV	Oral	IV	Oral	IV
Morphine (MSIR®) [CII]	O: 30-60 min D: 3-6 h	O: 5-10 min D: 3-6 h	30 mg	10 mg	15-30 mg q 2-4 h	2-10 mg q 2-4 h	0.3 mg/kg q 4 h	0.1 mg/kg q 2-4 h
Morphine extended release (MS Contin®) [CII]	O: 30-90 min D: 8-12 h	–	30 mg	10 mg	15-30 mg q 12 h	–	0.3-0.6 mg/kg q 12 h	–
Hydromorphone (Dilaudid®) [CII]	O: 15-30 min D: 4-6 h	O: 15 min D: 4-6 h	7.5 mg	1.5 mg	2-4 mg q 4 h	0.5-2 mg q 2-4 h	0.06 mg/kg q 4 h	0.015 mg/kg q 4 h
Hydrocodone/APAP 325 mg (Norco 5, 7.5, 10®) [CII] Hycet (7.5 mg/325 mg per 15 mL)	O: 30-60 min D: 4-6 h	–	30 mg	–	5-10 mg q 6 h	–	0.1-0.2 mg/kg q 4-6 h	–
Fentanyl [CII] (Sublimaze® Duragesic®) *Patch for opioid tolerant patients ONLY*	Transdermal O: 12-24 h D: 72 h per patch	O: immediate D: 30-60 min	–	100 mcg (0.1 mg)	Transdermal 12-25 mcg/h q 72 h	50 mcg q 1-2 h	Transdermal 12-25 mcg/h q 72 h	1-2 mcg/kg q 1-2 h (max 50 mcg/dose)
Methadone (Dolophine®) [CII] *Opioid tolerant patients ONLY*	O: 30-60 min D: >8 h (chronic use)	–	Variable	Variable	5-10 mg q 8-12 h	–	0.7 mg/kg/d PO/SC/IM/IV divided q 4-6 h prn severe chronic pain	
Oxycodone 5, 15, 30 mg (Roxicodone®), Oxycodone 5, 7.5, 10 mg/ APAP 325 mg (Percocet®), ER=Oxycontin® [CII]	O: 10-15 min D: 4-6 h	–	20-30 mg	–	5-10 mg q 6 h ER 10 mg q 12 h	–	0.05-0.15 mg/kg q 4-6 h	–
Tramadol (Ultram®) [CIV]	O: 1 h D: 3-6 h	–	300 mg	–	50-100 mg q 6 h Max: 400 mg/d	–	–	–
Codeine* 15, 30, 60 mg/APAP 300 mg	O: 1-2 h D: 4-6 h	–	200 mg	–	30-60 mg q 4 h	–	–	–

Note: Adapted from the Opioid Prescribing guidelines and Equianalgesic Chart (American Pain Society, 2016)

APPENDIX M

MANUSCRIPT SUBMITTED TO *THE JOINT COMMISSION JOURNAL ON QUALITY AND PATIENT SAFETY,* THE OFFICIAL JOURNAL OF THE JOINT COMMISSION

ABSTRACT

Using Comfort Menu to impact pain experience

Background: Pain management following spine surgery remains challenging. Pharmacological interventions are often the first line of treatment. However, these approaches may have side effects. Additionally, stakeholders of a 28-bed surgical spine unit in a large California Magnet hospital noted that patients had a prolonged hospital length of stay (LOS) when compared to patients from other surgical units. Finally, the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) pain satisfaction scores were lower than the desired goal, signaling a need for an improved pain management approach.

Methods: A quality improvement (QI) project was implemented at a spine surgical unit from July 16 to September 16, 2018. The purpose of this QI project was to improve patients' pain experience as measured by pain indicators and LOS in postsurgical spine patients through the development, implementation, and evaluation of a comfort menu of NPIs. The comfort menu contained the following 6 NPIs: acupuncture, pet therapy, hot/cold therapy, virtual reality, music therapy, and reiki/meditation. Postintervention assessment of pain scores and documentation of opioid consumption through the hospital's electronic medical record (EMR) was performed by nursing staff as part of standard of care.

Results: All pain indicators and LOS improved post-comfort-menu implementation. The aggregate mean Numerical Rating Scale (NRS) pain level decreased from 7/10 (baseline sample) to 6/10 (postimplementation sample), which was a percent change of 14.3%. Also, the aggregate

mean net opioid consumption from Morphine Equivalent Daily Dose ($MEDD_n$) decreased from 78.10 mg/day (baseline sample) to 48.53 mg/day (postimplementation sample), which was a percent change of 37.9%. Additionally, HCAHPS pain satisfaction score increased from 71.1% (baseline sample) to 100% (postimplementation sample), which was a percent change of 40.6%. Lastly, LOS decreased from 6.56 days (baseline sample) to 3.67 days (postimplementation sample), which was a percent change of 44.1%.

Conclusion: The implementation of the comfort menu not only improved spinal surgery patients' pain experience as evidence by an improvement of pain indicators and LOS, it also conformed to The Joint Commission (TJC) 2018 revised pain management requirements. By providing patients tools to reduce their pain and by including them in choosing the type of pain management treatments, patients may feel more empowered to utilize these NPIs to reduce their pain beyond their hospital stay.

INTRODUCTION

Acute postsurgical pain following spine surgery is a common experience (Montgomery & McNamara, 2016). Spine surgery is identified in the top six of 179 surgical procedures that cause a high level of pain (Bajwa & Haldar, 2015; Gerbershagen et al., 2013). Inadequate pain management contributes to undesirable patient outcomes including chronic pain, increased length of stay (LOS) and disability (Bajwa & Haldar, 2015; Gerbershagen et al., 2013). Studies suggest that the use of nonpharmacological interventions (NPIs) such as mind-body treatment, acupuncture, music therapy, and animal-assisted therapy are effective adjuvants for postsurgical pain (Blödt Pach, Roll, & Witt, 2014; Harper et al., 2014; Korhan et al., 2014; Vas et al., 2012). However, studies show that clinicians are often unaware of NPIs' efficacy in alleviating acute pain (Rhee et al., 2015; Tick et al., 2018).

Stakeholders of a 28-bed surgical spine unit in a large California Magnet hospital noted that patients have a prolonged LOS when compared to patients from other surgical units. Baseline data of 32 patients from the last quarter of the year 2017 showed that the average LOS was 6.56 days, which was beyond the goal of 4.24 days. One of the major barriers for discharge was pain. Additionally, the HCAHPS pain satisfaction score for the spine unit was 71.1%, which fell below The Joint Commission's (TJC's) goal of 75.4%, signaling a need for an improved pain management approach.

METHODS

COMFORT MENU DEVELOPMENT AND IMPLEMENTATION

The development and implementation of a comfort menu consisting of six available NPIs aimed at improving patients' pain experience following spine surgery. To establish baseline information the authors completed a preliminary needs assessment using a retrospective chart review of 32 patients who did not use any NPIs from October to December 2017. The baseline sample had a mean NRS pain level of 7 out of 10 and a mean $MEDD_n$ of 78.10 mg per 24 hours on postoperative day 2 were noted. Also, the HCAHPS pain satisfaction score of 71.1% for the unit during that period (October to December 2017) was below the desired goal of 75.4%. Lastly, the average mean LOS was 6.56 days. These findings led to the development of this QI project with the purpose of improving patients' postsurgical spine pain experience. Wherein, patients' pain experience was measured by pain indicators (NRS pain level, opioid consumption through $MEDD_n$ calculation, and HCAHPS pain satisfaction score), and hospital LOS.

The Plan-Do-Study-Act (PDSA) model (Institute for Healthcare Improvement [IHI], n.d.) for improvement was used to guide this project. The first step of the PDSA model involved planning. In this project, current pain management standards were reviewed, and the proposed project were discussed with stakeholders at the unit. A laminated comfort menu for patients (Appendix E) was developed and included six NPIs (acupuncture, pet therapy, hot/cold therapy, virtual reality, music therapy, and reiki/meditation). A comfort menu instructional guide for nursing staff (Appendix F) was also developed to assist the nurses (e.g., how to order an NPI, office hours and phone numbers of the department providing the service).

The second stage of the PDSA involved the implementation of the comfort menu, specifically, nurses educated patients regarding the availability of a comfort menu at the beginning of their shifts and intermittently after that. To enhance ease of use and accessibility, the comfort menu was made available in every patient's room and around each nursing station. Also, nurses documented the NPI interventions that a patient chose and postintervention pain scores.

In the third stage, the pain indicators (NRS pain level, HCAHPS pain satisfaction scores, and $MEDD_n$) and LOS were studied and compared from baseline (October to December 2017) to post-comfort-menu implementation (July 16 to September 16, 2018). The $MEDD_n$ was calculated using an equianalgesic chart from the American Pain Society (2016). Also, the nursing staff at the surgical unit were asked to complete a three-item open-ended survey (Appendix K) to document their perceptions of the comfort menu.

Lastly, the act stage commenced with the enumeration and discussion of the challenges and barriers encountered during the QI project implementation as well as plans for future adjustments based on lessons learned. These included early introduction of NPIs to patients (presurgical admission), consistent nurse to patient communication of NPIs availability (upon admission or throughout the shift), house-wide teaching of NPIs to all hospital staff, and exploration of other NPIs that may be beneficial to the patients.

SETTING AND ETHICS

The project was implemented in a 28-bed unit for spine surgery in a nonprofit, tertiary, level 1 trauma Magnet hospital located in the greater Los Angeles area. The Institutional Review Board (IRB) at the project hospital exempted the project from review because the QI project was considered nonresearch and did not require oversight by the IRB.

MEASURES

The outcomes were measured by calculating the aggregate mean NRS pain level, the $MEDD_n$ per 24-hour period, and the hospital LOS. The $MEDD_n$ was calculated by deducting a patient's baseline opioid use (total MEDD consumption before surgery) from the MEDD consumed on the day that an NPI was used. The $MEDD_n$ showed an actual measurement of opioids consumed as a result of the acute pain from spine surgery versus opioid consumed from chronic pain prior to the current surgery. The LOS outcome of the patients (baseline and postimplementation sample) was calculated by counting the days from admission to the date of a patient's discharge. The HCAHPS pain satisfaction scores were acquired monthly by the nursing management.

RESULTS

A total of 103 patients were involved in this project. Baseline data were established based on 32 patients who did not use any NPIs in the period prior to initiating the comfort menu. The data on 71 patients who used the NPIs after the implementation of the comfort menu were used to assess the outcomes of implementation of the comfort menu. Patients' demographics and clinical characteristics are summarized in Table 1.

Table 1. Sample Demographics (*N* = 103)

	Baseline (*n* = 32)	Postimplementation (*n* = 71)
Age	62 (15)	60 (13)
	Range: 25-94	Range: 16-83
	Median 66	Median 63
Gender	Female 18 (56.25%)	Female 35 (49.3%)
	Male 14 (43.75%)	Male 36 (50.7%)
Previous Spine Surgery	Yes 22 (68.75%)	Yes 48 (67.6%)
	No 10 (31.25%)	No 23 (32.4%)
Level of Surgery	Single 8 (24%)	Single 22 (31%)
	Multilevel 24 (75%)	Multilevel 49 (69%)

Table 2 summarizes the NRS pain level, $MEDD_n$, and LOS at baseline and postimplementation of the comfort menu. The results showed that baseline patients experienced severe pain (7 to 10 out of 10 NRS pain level) on average (mean NRS pain level = 7, *SD* = 1.26), as compared to patients in post-comfort-menu implementation of moderate pain (4 to 6 out of 10 NRS pain level) on average (mean NRS pain level = 6, *SD* = 1.46). Patient's pain perception slightly decreased from baseline to postimplementation period. It is important to bear in mind that these patients undergone spine surgery, wherein the presence of pain, sometimes high level of pain is a common experience (Bajwa & Haldar, 2015; Gerbershagen et al., 2013; Montgomery & McNamara, 2016).

Table 2. Baseline and Postimplementation Outcome Scores

	Baseline (*n* = 32) [a]			Postimplementation (*n* = 71) [b]		
	Mean (*SD*)	Median	Range	Mean (*SD*)	Median	Range
NRS	7.00 (1.26)	6.68	3.33-9.86	6.00 (1.46)	5.75	1.17-8.90
$MEDD_n$	78.10 (65.85) [c]	70.00	-55.00-230.00	48.53 (56.84)	45.00	-85.00-210.00
LOS	6.56 (4.33)	5.50	2.00-21.00	3.67 (2.28)	3.00	1.00-12.00

Note. NRS = Numerical Rating Scale; $MEDD_n$ = Net Morphine Equivalent Daily Dose; LOS = length of stay.
[a]The number of patients (32) who did not use any NPIs prior to implementation of the comfort menu in the assessed sample.
[b]The number of patients (71) who used NPIs after the implementation of the comfort menu.
[c]One patient from baseline group who used 654 $MEDD_n$ was removed in calculating the mean $MEDD_n$.

The second pain indicator of $MEDD_n$ was calculated by deducting a patient's baseline opioid use from the 24-hour opioid consumption used. Results showed that baseline patients have a higher opioid requirement (mean $MEDD_n$=78.10, *SD = 65.85,* median=70.00, range= -55.00 to 230.00*)*, as compared to patients in post-comfort-menu implementation (mean $MEDD_n$=48.53 mg, *SD=56.84,* median=45.00, range = -85.00 to 210.00). One patient from the baseline sample used about 654 mg $MEDD_n$ in a 24-hour period and was considered an outlier thereby it was removed in calculating the mean $MEDD_n$.

In addition, the average mean LOS of baseline patients was higher at 6.56 (*SD* = 4.33), as compared to postimplementation period of 3.67 (*SD* = 2.28). While stakeholders from the spine surgical unit noted that pain was one of the barriers for early discharge, there are other factors that can contribute to patient's increase in LOS. Variables other than pain were not explored in this project. The percentage changes on NRS pain level, $MEDD_n$, LOS, and HCAHPS pain satisfaction scores from baseline to postimplementation of the comfort menu was summarized on Figure 2.

Percent Change of Outcomes from Baseline to Postimplementation

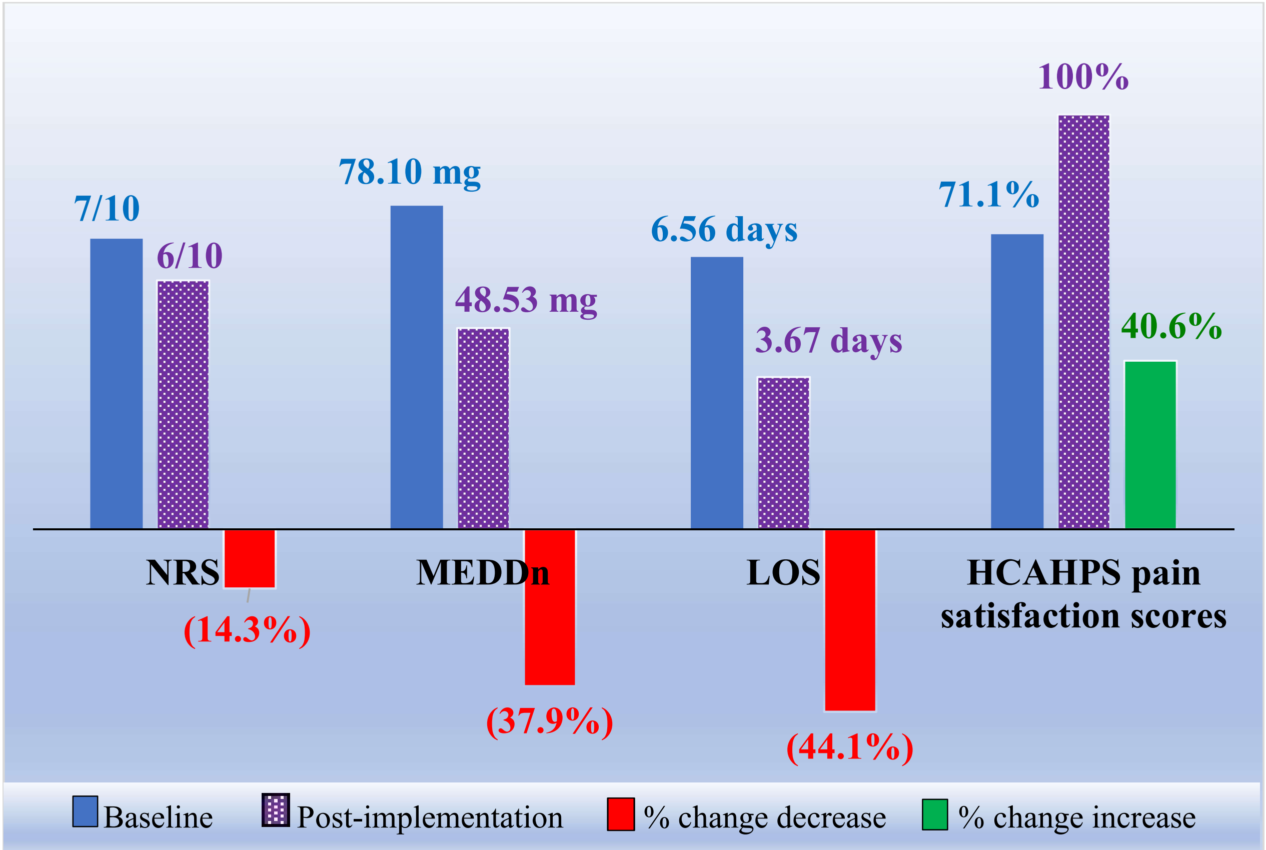


Figure 2. A decrease in Numerical Rating Scale (NRS) pain levels (a percent change of 14.3%), a decrease in Net Morphine Equivalent Daily Dose ($MEDD_n$) opioid consumption (a percent change of 37.9%), a decrease in length of stay (LOS) (a percent change of 44.1%), and an increase in Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) pain satisfaction scores (a percent change of 40.6%) as compared to baseline.

A total of nine members of the nursing staff completed the survey given after post-comfort-menu implementation. All of them identified the hot/cold therapy as the most commonly requested NPI, followed by pet therapy and reiki/meditation. One nurse pointed out that one patient refused the comfort menu and expressed preference for pharmacological interventions. Another nurse stated that another patient refused the NPI and preferred that it was given after the pain medication, not before, or with, it. However, 8 out of 9 nurses stated that patients were open to the NPIs offered in the comfort menu.

DISCUSSION

The NPIs improved all pain outcome indicators and LOS as evidenced by a decrease in NRS pain levels (a percent change of 14.3%), a decrease in $MEDD_n$ opioid consumption (a percent change of 37.9%), an increase in HCAHPS pain satisfaction scores (a percent change of 40.6%), and a decrease in LOS (a percent change of 44.1%) as compared to baseline. There was a decrease, on average, in the aggregate mean NRS pain level from 7 (baseline) to 6 (postimplementation) out of 10; clinically, this slight change could indicate a drop in the pain grade from severe to moderate, on average, after the implementation of the comfort menu. There was a clinically significant decrease in aggregate mean opioid consumption from $MEDD_n$ of 78.10 mg/day (baseline) to 48.53 mg/day (postimplementation). The decline of opioid consumption reduces a patient's risk for opioid overdose. The CDC recommends that clinicians practice caution in increasing dosage greater than 90 morphine equivalent per day as this increases the threshold risk for opioid overdose (CDC, n.d.). However, it should be noted that at the time of the implementation of the comfort menu, other house-wide opioid mitigating initiatives (e.g., staff education, opioid overdose tracking, to name a few) were concurrently being implemented at the institution. Therefore, the decline of opioid use can also be attributed to the LOS which decreased from 6.56 days (baseline) to 3.67 days (postimplementation).

The HCAHPS pain satisfaction score increased from 71.1% to 100%. However, the increase of the HCAHPS pain satisfaction scores should be interpreted with caution because HCAHPS' developers revised the question that assesses the pain experience in early 2018. The revised HCAHPS pain satisfaction scores question assesses patients about hospital staff's communication with them about their pain ("During this hospital stay, how often did hospital staff talk with you about how much pain you had?"). Whereas, the question in the baseline sample asked patients to evaluate how often was their pain controlled ("During this hospital stay, how often was your pain controlled?" [TJC, 2017]). The change in question, as well as the concurrent hospital wide opioid reduction initiative, may have contributed to the improvement of HCAHPS pain satisfaction score.

The majority of patients during the implementation period of the comfort menu used hot and cold therapy (92.95%). Since hot and cold therapy was the most commonly used NPI, the mild reduction of pain outcome may be attributed to this specific NPI. Similar to current literature, the project outcome also showed that hot and cold therapy resulted in a mild reduction in pain scores (Aciksoz, Akyuz, & Tunay, 2017; Lewis et al., 2012; Quinlan et al., 2017). Although the result is mild, superficial heat or cold therapy is generally safe and effective and thereby recommended by the ACP to be the first line of treatment for acute postoperative pain and subacute low back pain (Qaseem et al., 2017). Additionally, due to its easy accessibility, nurses may tend to administer it more in comparison to other NPIs. Pet therapy (12.67%) was the second most commonly used NPI in this project. However, the nursing staff commented that one of the barriers of pet therapy's utilization was the limited availability of pets since it was a volunteer type of service.

The nurses involved with the QI project identified several recommendations to improve the use of NPIs for their patients. These include offering the comfort menu consistently by the RNs and ensuring communicating with patients about their preference about which NPI they are willing to try first thing during their morning rounds. Also, due to issues of accessibility, certain NPI such as acupuncture, reiki, meditation and pet therapy needed to be ordered or arranged in advance. Another nursing suggestion includes encouraging NPI education at the bedside, especially on admission, and after admitting a patient from the recovery room. Lastly, nurses suggested that providers consider educating their patients at the clinic about the NPIs. By introducing the availability of NPIs as early as preoperative stage, patients may take the time to learn more about them and decide which ones best fit with their preferences and what they know work for their pain.

LIMITATIONS

The QI project was implemented in postsurgical spine patients and the results may not be applicable to other patients who had other types of surgery. Most patients used hot and cold therapy, thus improvement of pain outcomes may be attributed to this specific NPI. However, pain outcome assessments of the other forms of NPIs are not possible due to the limited number of its use. Availability of information such as pain scores and NPI as pain intervention was dependent on nursing staff's documentation. Thereby the possibility of missing patients who received the NPI during the implementation period was likely. Nursing staff's bias with regard to the type of NPI may also have had an indirect impact on a patient's choice of an NPI. Additionally, certain NPIs that required additional steps, such as ordering in the electronic health record or calling a department, may have discouraged interest amongst patients or staff as it was not readily available.

CONCLUSIONS

The QI project of a comfort menu of NPIs showed that NPIs improved patients' pain experience as evidenced by a decrease in NRS pain levels, a decrease in $MEDD_n$ opioid consumption, an increase in HCAHPS pain satisfaction scores, and a decrease in LOS as compared to baseline. The implementation of the comfort menu not only improved spinal surgery patients' pain experience, it also conformed to TJC 2018 revised pain management requirements. However, caution is warranted in generalizing our results in that several pain management initiatives were being implemented concurrently during the period of this project. By providing patients the tools to reduce their pain and by including them in choosing the type of pain management treatments, patients may feel more empowered to utilize these NPIs to reduce their pain beyond their hospital.