4-21-2017

Effects of Therapeutic Music on Pain in Spinal Surgery Recovery

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EFFECTS OF THERAPEUTIC MUSIC ON PAIN IN SPINAL SURGERY RECOVERY

by

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EVIDENCE-BASED PRACTICE PROJECT REPORT

Submitted to the College of Nursing and Health Professions

of Valparaiso University,

Valparaiso, Indiana

in partial fulfillment of the requirements

For the degree of

DOCTOR OF NURSING PRACTICE

2017

Student 4-21-17 Date

Advisor 4.21.17 Date

DEDICATION

I would like to dedicate this project to God and my family. Rachel, Liam, and Lily have lovingly supported me and sacrificed much at times throughout the DNP journey. I would have not completed this journey without such love and support.

ACKNOWLEDGMENTS

I would like to thank my faculty advisor Dr. Jeffrey Coto for his support and editorial skills that allowed me the success I have had during this process. I also want to thank my facility liaison Sylvia Coffing PhD, MSN, RN, CHC. Her support and openness to my project improved the successful outcomes of this project. To my co-investigators Jordan Cooper RN and Amanda Cooper RN, you have my immense gratitude for keeping me on task at times and overseeing parts of my project when I was unable to make it to the hospital. To the awesome inpatient nursing staff to which this project would not been complete. Finally, to my fellow classmates and friends who have endured with me. Your constant encouragement and listening ears helped me get to the end.

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ABSTRACT

Pain is one of the most common experienced symptoms reported by more than 80% of postoperative patients. Approximately 77-98% of postoperative patients report pain following their procedure with 40-80% having moderate to severe pain. Pain is shown to elevate stress levels manifesting in increased heart rates, blood pressures, and oxygen demand. Inadequate pain control can develop into surgical complications causing surgical failure, blood clots, pneumonia, and chronic pain. Complimentary and alternative medicine such as music can be used in combination with opioid medication help improve pain control leading to successful surgical outcomes. The purpose of this evidence-based practice project was to determine if implementing therapeutic music into the post-operative recovery process improves reported pain scores and decreases pain medication usage in milligrams in adult spinal patients. The evidence-based medicine (EBM) model was used to guide this evidence-based project. The project was implemented in a small Northwest Indiana facility. An extensive review of the literature was completed directing the creation of a therapeutic music protocol. The organization formally approved the protocol and education was provided to the inpatient nursing staff. A one-group pretest-posttest comparison design was conducted to streamline the protocol. Implementation occurred on postoperative days 3 and 4 for each participant and data was collected during weekly chart audits. The mean day 3 pain scores were (M = 5.769, SD = 1.945; M = 5.692, SD = 1.954; M = 5.692, SD = 2.112) compared with day 4 scores with corresponding time (M = 5.115, SD = 2.268, p = .000; M = 4.846, SD = 2.110, p = .000; M = 4.846, SD = 2.344, p < .004). Medication amounts were compared in the same manner resulting in day 3 (M = 37.673, SD = 45.008; M = 35.682, SD = 33.506; M = 35.798, SD = 37.313) and day 4 (M = 37.172, SD = 47.161, p = .000; M = 29.961, SD = 35.748, p < .019; M = 31.451, SD = 37.437, p = .000). The results demonstrate a significant difference in decreases in pain scores and milligrams of morphine when therapeutic music is used in combination with opioid pain medication.

Key words: music, postoperative, pain, and surg*

CHAPTER 1

INTRODUCTION

Background

Pain is a multidimensional experience that signals the brain that the body is injured or not in homeostasis (Pellino et al., 2005; Selimen & Andsoy, 2011). According to Cole and LoBiondo-Wood (2014), pain is defined as an "unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" (p. 406). The complexity and subjectivity of the pain experience and its affects across all ages, races, cultures, and socioeconomic status create difficulties seen today for treatment (Kankkunen & Vaajoki, 2014). The pain experience includes physiological, sensory, emotional, cognitive, behavioral, and sociocultural aspects, which contribute to the overall intensity and perception (Kankkunen & Vaajoki, 2014). Pain is a common reaction following surgery as more than 80% of postoperative patients report moderate to severe pain (Whitaker, 2010). Alternate pain therapies have been historically good options to help with pain in many clinical settings. One alternate therapy is music, which has been used in surgical practice since 1914 and was encouraged by Florence Nightingale to help improve the hospital experience (Hole, Hirsch, Ball, & Meads, 2015). Therapeutic music has been extensively studied but is not a regularly used therapy in the hospital or clinical settings.

Statement of the Problem

Pain control continues to be a major concern for postoperative patients, especially for major elective operations such as total knee arthroplasty (TKA), total hip arthroplasty (THA), and spinal surgeries.

Data from the Literature Supporting Need for the Project

Lin et al. (2010) reported that 77-98% of postoperative patients experience pain after surgery with 40-80% reporting moderate to severe pain levels and pain management is reported to be less than ideal in 40-50% of patients. Pain elevates stress levels, which increase heart

rate, blood pressure, and oxygen demand due to an increased sympathetic response (Allred et al., 2010). Complications can develop without pain control including surgical failure, blood clots, pneumonia, and chronic pain (Lin et al., 2011; Uphold & Graham, 2013). According to Copp (2006), adequate pain management is an ethical responsibility of professional conduct. However, Good et al. (2010) reported 50 to 75% of postoperative patients do not receive adequate pain control.

> Activities that contribute to increase pain include cough and deep breathing, physical and occupational therapies, and regular scheduled movements with nursing staff are important in the recovery process as they prevent joint stiffness, encourage circulation to prevent blood clots, and promote full lung expansion to prevent pneumonia (McCaffrey & Locsin, 2006).

Reducing and controlling this reported pain has been shown to decrease the length of stay, maximize resting and circadian rhythms, and lead decrease health care costs (Allred, Byers, & Sole, 2010; Lin, Lin, Huang, Hsu, & Lin, 2011; McCaffrey & Locsin, 2006).

Data from the clinical agency supporting the need for the project

The Center for Medicare and Medicaid Services (CMS) and the Agency for Healthcare Research and Quality (AHRQ), survey patients after discharge regarding their experience and quantify quality care scores (Medicare.gov, 2015). A small physician owned medical and surgical specialty hospital in the Midwest, currently ranks in the top 1% overall in patient satisfaction compared to the nation and #1 in the state of Indiana (Studor Group, 2015). Patient satisfaction scores are a nine or 10 out of ten 94% of the time, yet 81% of patients rate their pain was always well controlled (Medicare.gov, 2015). Almost 20% of patients experienced pain that was not always well controlled most of their visit. The mission and vision of this hospital is centered on patient satisfaction and experience, which are directly impacted by postoperative pain.

Standard of Care

The current standard of care for postoperative pain management is providing scheduled and as needed analgesic and opioid medications that can cause potentially harmful side effects. Research indicates that medications alone do not provide adequate pain relief in all patients (Comeaux, & Steele-Moses, 2013). Pain affects the physiologic, sensory, affective, and cognitive aspects of each patient. Adjuvant and alternate therapies, in combination with medication, are needed to help adequately control pain in this patient population. Music, in particular, has shown to help decrease pain intensity when used concurrently with medication (Lin et al., 2011; McCaffrey & Locsin, 2006; Vaajoki, Pietila, Kankkunen, & Vehyilainen-Julkunen, 2011).

Therapeutic Music

Humans have listened to music for centuries. Ancient texts including the Bible and ancient Egyptian papyrus indicate the use of music for human suffering and spiritual gain (Bowers & Wetsel, 2014). Ancient Greeks and Romans used music in healing spas for relaxation and physiologic repair (Bernatzky, Presch, Anderson, & Panksepp, 2011). Lullabies are used to sooth and comfort babies, radio and MP3 players are used for entertainment, and music is a staple of most religious gatherings. Music is currently used in multiple settings including surgery, palliative and hospice care, and psychological therapy. Therapeutic music effectiveness can be explained by the gate control theory and can be visualized on positron emission tomography (PET) and functional magnetic resonance imaging (fMRI) scans (Vaajoki et al., 2011; Salimpoor, Benovoy, Larcher, Dagher, & Zatorre, 2011). According to Dunn (2004) and Vaajoki et al. (2011), pain is perceived through neurological fibers that signal the brain an injury has occurred. These nociceptive fibers fire electronic signals but can only transmit so many signals at one time (Dunn, 2004). Music has been theorized to close the gate or decrease the intensity of the pain signals via interrupting the pathway (Vaajoki et al., 2011). Music has also been connected to activating emotional centers of the brain including the dorsal and ventral striatum and right caudate and nucleus accumbens on PET and fMRI scans

(Salimpoor et al., 2011). According to Salimpoor et al. (2011), activation of these areas cause a dopamine release that is connected to a pleasurable state, which arouses the autonomic nervous system (ANS) also causing changes in physiologic responses. Therefore, music has been shown to reduce stress by decreasing heart and respiration rates, enhancing relaxation, lessening anxiety, and improving mood (Good et al., 2010). Therapeutic music is cost effective, needs little training, and gives nurses the ability to help in pain control (Allred et al., 2010). Music also gives the patient control over their pain management by allowing the freedom of use at any time and choice of music without any side effects (Vaajoki et al., 2011).

Purpose of the Evidence-Based Practice Project

The purpose of this project is to validate current evidence-based practice research by demonstrating music in combination with traditional postoperative pain management reduces pain of adult postoperative spinal patients. The results from this evidence-based project can be used to create a policy to include adjuvant therapies, like music, into postoperative care plans to help better control postoperative pain.

PICOT Question. Do adult postoperative spinal patients, who use therapeutic music on postoperative day four, report reduced pain scores and require less opioid medication at a small Midwest physician owned hospital?

Significance of Project

The goal of this DNP project is to establish a protocol for therapeutic music in the postoperative inpatient setting. The organization will be allowed to use the results to create a policy and procedure to include therapeutic music as a regular postoperative intervention. Inadequate pain control can lead to insufficient sleep, delayed wound healing, patient dissatisfaction, longer hospital stays, and increased health care costs (Allred et al., 2010). According to an Institute of Medicine (IOM) report (2011), “spine surgical procedures cost Medicare $1 billion annually” (p. 92). In general, “pain has been shown to cost society between $560-635 billion annually or about $2,000 for every person in America” (IOM, 2011, p. 100).

This EBP project establishes a therapeutic music process that decreases postoperative pain levels as recommended by the evidence. Utilizing this process can improve postoperative pain, increase patient satisfaction, reduce pain medication usage, and decrease length of stay which reduces overall health care costs to the patient.

CHAPTER 2

THEORETICAL FRAMEWORK, EBP MODEL, AND REVIEW OF LITERATURE

Theoretical Framework

Overview of Theoretical Framework

Therapeutic music has been researched in great detail. This Evidence Based Practice (EBP) project will utilize current research to build upon the known evidence and emphasize best practice in the inpatient postoperative setting. This project will encompass a foundation incorporating Jean Watson's theory of transpersonal caring, evidence-based medicine (EBM) model, and an extensive literature search and review to build the platform for a practice change. This chapter will provide a review of these frameworks and discuss how they promoted a practice change within this project. The review of current evidence is also presented with in depth appraisals that build the foundation for this practice change. A PICOT question was developed using these frameworks and evidence to start this process.

Application of Theoretical Framework to EBP Project

Theoretical Framework: Jean Watson

Jean Watson's theory of transpersonal caring is a foundational nursing theory that is used at the university and clinical levels for the basis of nursing care (George, 2014). The theory of transpersonal caring was developed to emphasize holistic caring is the center of nursing practice (Morris, 2006). This foundational middle range theory focuses on the relationship that is developed between the nurse and patient (Watson, 2010). This relationship is a deep inner connection based on nursing presence and consciousness in the moment (Watson, 2010). Transpersonal caring includes ten clinical caritas that focus on the human dimensions of the mind, body, and spirit to the nursing practice (Watson, 2010). These clinical caritas are at the heart of this theory and guide nurses to create a deeper spiritual connection during interactions with their patients. The client and nurses ideas, feelings, and needs come together in a mutual understanding to create a relationship founded on respect and love

(Watson, 2010). This special kind of caring comes together in one moment called the caring moment, which combines caring, healing, and harmony of the human condition in both the patient and nurse (Caruso, Cisar, & Pipe, 2008). Postoperative pain disrupts this balance causing disharmony and the need for rebalance (George, 2014).

According to Lin et al. (2011), pain interferes with emotions, activity, quality of sleep, and appetite. Increased anxiety is also noted with surgical intervention and postoperative pain including symptoms of elevated blood pressure (BP), heart rate (HR), body temperature, and respirations (Chen, Chen, Huang, Hsieh, & Lai, 2015; Lin et al., 2011). This mind and bodily imbalance causes an unhealthy state, as defined by Watson (George, 2014). Uncontrolled pain and this unhealthy imbalance can lead to complications in resting and circadian rhythms, delayed wound healing, treatment dissatisfaction, longer hospitalization, and increase health care costs (Allred et al., 2010). With the current standard of care in postoperative pain, patients react passively in helping to manage their pain and nurses tend to underestimate pain shying away from opioid use, which have many negative side effects (Good et al., 2010; Allred et al., 2010). This combination of patient condition and nursing attitude, strains the relationship and can intensify the pain response of the patient. According to Bernatzky, Presch, Anderson, and Panksepp (2011), “music is a fundamental aspect of human experience, strongly linked to our intrinsic motive systems that is deeply ingrained in all cultures (p. 1990). Selimen and Andsoy (2011) discuss the importance of adjuvant pain and anxiety therapies during the perioperative period to complete a holistic nursing approach supporting the needs of the patient and family. Combining the traditional pain management approach with complimentary pain therapy such as music continues to provide improved reported pain scores in large systematic reviews (Cole & LoBiondo-Wood, 2014).

Strengths and Limitations of Theoretical Framework for EBP Project

Watson’s theory does not provide a systematic hierarchy in on how to change practice or even provide suggestion for best practice in detail. It would be difficult to fulfill all of the ten

caritas with every patient interaction due to time restraints, patient loads, and charting requirements. However, the theory of transpersonal caring provides insight to why current evidence shows that complimentary and alternative medicine (CAM) therapies improve pain and patient satisfaction (Hole et al., 2015). Using a theory that has been underpinned by the foundations of nursing and exemplifies the patient-nurse interaction implies the importance of holistic care. Adding music and other therapies that nurses and patients can control, develop the importance of the role each patient plays in their own recovery process.

Evidence-Based Practice Model

Overview of EBP Model

Evidence-Based Practice Model

The EBM is a method of generating and assessing research evidence on various treatments and their clinical effectiveness (Charles, Gafni, & Freeman, 2010). Akonberg (2005) defines EBM as an "integration of best research evidence with clinical expertise and clinical values" (p. 837). This model emphasizes best practice by using the scientific method to incorporate science into medical practice augmented with patient preferences and clinical values (Charles et al., 2010). The EBM model uses the triad of clinical practice as the foundation of practice change, which includes clinical expertise, best research evidence, and patient values and expectations (Florida State University College of Medicine [FSU-COM], 2016). There also are five stages in which this model uses to make a change in practice including formulating a clinical question, finding the evidence, appraising the evidence, applying the evidence, and evaluating performance (Akonberg, 2005). When formulating the clinical question, it is important for the question to be focused and specific. A PICOT question will be developed in this stage defining the specific patient population, intervention or treatment of focus, a comparison patient group or treatment, and a defined outcome. The third step is critically appraising evidence for validity, effect size, and precision (Akonberg, 2005). The appraisal tool used for EBM model reviews the PICOT question, making sure the search was

complete, whether inclusion criteria was appropriate, reviews the validity of included studies to the PICOT question, and continuity of study results (Centre for Evidence Based Medicine [CEBM], 2016). A section is also used to review the results in depth for heterogeneity (CEBM, 2016). The fourth step in the process is application of the evidence. This step fulfills the EBM triad combing clinical expertise, evidence of research, and patient centered care (FSU-COM, 2016). Applying the evidence is completing or suggesting the treatment be completed with the patient or patient group of interest (Akonberg, 2005). The last step in this process is evaluating the performance. Evaluating the treatment and the process will help find if there was an improvement in care. The EBM model answers the PICOT question by providing an evaluating process that reviews current evidence to focus the practice change. This practice change is implemented and evaluated for clinical significance.

Application of EBP Model to EBP Project

This project has used the EBM model as a guideline for making a practice change. In the first step of this process, moderate to severe pain is reported by 80% of postoperative patients (Allred et al., 2010). A PICOT question was developed; do adult postoperative spinal patients, who use therapeutic music on postoperative day four, report reduced pain scores and require less opioid medication compared to day 3 without music at a small Midwest physician owned hospital? An extensive search of the literature was completed using five databases. Twelve studies were selected and appraised using the Melnyk and Fineout-Overholt pyramid of evidence and John Hopkins Evidence-Based Practice (JHNEBP) tool (JHNEBP, 2012, pp. 238-240). The best practice was identified in the literature, which included listening to music 60-80 beats per minute of patient choice at least three times per day for at least 30 minutes (Joanna Briggs Institute [JBI], 2009). The fourth stage of this process was implementation of this project. A plan was designed with an organization representative and researcher to use therapeutic music on day four of the stay. However, data would be collected on days three and four and compared by utilizing chart review. The nursing staff will encourage the patients, on day four, to

listen to preferred music from a choice of five internet radio stations for at least 30 minutes three times during the day. Further discussion will be revealed in the methodology section of this proposal. Stage five of this process is the evaluation of data. Once the data is collected, a detailed evaluation of these results will take place utilizing a statistical design and confidence intervals of 95%. A list of recommendations and changes for future research will be provided.

Strengths and Limitations of EBP Model for EBP Project

The EBM model was created to for physician use in the medical approach to care. While this model has many similarities to the nursing approach, the steps are open for some interpretation. The holistic approach in nursing is captured by this model, using the EBM triad as a foundation (FSU-COM, 2016). However, there is an emphasis on the medical approach to care. The EBM model was also created for single and small groups of patient in a clinical practice. However, the limited specificity in each step allows for larger groups of participants. While there are some negatives, the steps of the EBM model are easy to follow and can be altered to fit different utilization tools. The EBM model also comes with a suggested pyramid of evidence and appraisal tool, which are similar to other tools utilized in nursing theory. Extensive research and years of model changes have developed the current EBM model creating a strong foundation for use in the clinical setting.

Literature Search

Sources Examined for Relevant Evidence

Research articles were located using the CINAHL, MEDLINE, Proquest, Cochrane Library, Joanna Briggs Institute EBP database, and citation chasing. Boolean operators used to narrow the search included music, postoperative, pain, and surg*. Search limiters, to narrow the search, were publication years between 2010-2016, English language, and scholarly peer reviewed. The inclusion criteria for articles in this project included adult patient population over the age of 18, spinal surgery, abdominal surgery, joint replacement surgery, and therapeutic music intervention used to reduce postoperative pain. Articles were excluded that were

exclusively cardiovascular surgeries, gynecological surgeries, neurological surgeries, and therapeutic music not used for pain reduction.

Results

CINAHL produced 37 results that matched the search terms and limiters. The titles and abstracts were reviewed and five articles were chosen for review for a critical appraisal. Next, the search terms and limiters were applied to MEDLINE, which produced 52 results. Twenty-two articles were identified that matched the inclusion criteria and no new articles were chosen for critical appraisal. Proquest produced the largest number of results 314, which twenty met the inclusion criteria and three was chosen for critical appraisal. The Cochrane library produced 24 results, which three met inclusion criteria and one was critically appraised. The search completed in the Joanna Briggs Institute produced 23 results. Three articles met the inclusion criteria and two were critically appraised. There were two common articles referenced by several of results reviewed by the researcher. These articles were located using citation chasing and located in CINAHL. A grid was produced to summarize nine main articles used for the basis of this review (see Table A).

Table 2.1. Levels of Evidence

Hierarchy of Evidence	Number included in Project
Level 1- Systematic Reviews/Meta-analysis of RCTs	5
Level 2- RCT Design	2
Level 3- Controlled Trials, Quasi-experimental Designs	2
Level 4- Case-Control, Cohort Studies	0
Level 5- Systematic Reviews of Descriptive or Qualitative Studies	0
Level 6- Descriptive, Qualitative Studies	0
Level 7- Expert Opinion, Report of Expert Committees	0

Appraisal of Relevant Evidence

These nine articles were appraised using Melynk and Fineout-Overholt's (2011) pyramid of evidence and JHNEBP tool (JHNEBP, 2012, pp. 238-240). The Melnyk and Fineout-Overholt's (2011) pyramid of evidence is a hierarchy that has seven levels of evidence (Table 1) ranking articles level one, strongest, to level 7, weakest. The JHNEBP tool reviews the study design, results, and conclusions. Based on this review, a quality grade is given to help determine the strength of evidence. A grade of an A is the best and highest level of evidence. A grade A rating include articles that have "consistent results, sufficient sample size, adequate controls, and definitive conclusions" (JHNEBP, 2012, p. 240). A grade B is given to articles that are good quality and include "reasonably consistent results, sufficient sample sizes, some control, and fairly definitive conclusions" (JHNEBP, 2012, p. 240). A grade C is given to articles that are low quality or have major flaws (JHNEBP, 2012, p. 240). The strengths and weaknesses of each article were analyzed and determined (Table 2.2).

Level one. Cole and LoBiondo-Wood (2014) performed a systematic review to evaluate how music affects pain control of hospitalized patients. The authors search CINAHL, MEDLINE, Natural Standard, and Scopus databases for evidence. Their search terms included music, music therapy, pain, adults, inpatient, random controlled trials, and hospitalized. Search limiters were English language publication and timeframe January 2005 to March 2011. Seventeen articles met the inclusion criteria including two focusing on pregnant women, four studies centered on intensive care unit (ICU), three were on general medical patients, and seven were conducted using postoperative patients. There was a total of 1,937 participants from five continents and included a variety of different medical specialty areas in the inpatient setting. Thirteen of the 17 studies, found music interventions reduced pain levels. Among the pregnant

women studies, the authors reported reduced pain in postcesarean surgery and latent labor phase patients in the music group. Opioid use was also less in the postcesarean surgery music group. Three of four studies focusing on ICU, found music helped reduce pain in vulnerable patient groups. The authors also noted reduced muscle tension and HR in the music groups. Two of the studies that included medical patients noted reduced pain in the music groups. The authors reported five of the seven studies on surgical patients found reduced pain scores in the music groups. Many of the studies reviewed by the authors found positive results including reduced anxiety, stress, and increased relaxation and hospital perception. Critically appraising this article, it is a level one on the Melnyk-Fineout-Overholt hierarchy and high quality using the JHNEBP tool.

Economidou et al. (2012) completed a systematic review of literature examining the effects of music therapy reducing postoperative pain in major elective surgeries. The sample was adequate and appropriate for a systematic review of 6 articles, one double-blinded controlled trial and five randomized control trials (RCT), and 886 participants. Participants were randomly assigned to groups in all studies and the intervention was standardized due to the inclusion and exclusion criteria the authors indicated in the study. Music therapy must be music, 60-80 beats per minute, and is calming in nature. The groups in all studies were treated equally with the exception of the music therapy intervention. Inclusion criteria were adult patients undergoing elective surgery, under general anesthesia, requiring post-operative pain relief, like a patient controlled analgesia (PCA) or opioid analgesic. Data collection methods were detailed and presented clearly and adequately for replication. MeSH terms included post operat*, postoperative period, music, pain, pain postoperative, post surg*, posteropertive care, music therapy, and analgesia. Each study included measuring pain using the Visual Analog

Table 2.2. Appraisal of Evidence

Reference & Level of Evidence & Database	Design, Sample, & Procedure	Data Evaluation	Measurement Tools
Allred, K. D., Byers, J. F., & Sole, M. L. (2010). The effect of music on postoperative pain and anxiety. *Pain Management Nursing, 11*(1), 15-25. doi:10.1016/j.pmn.2008.12.002 LOE: Level 2, High Quality Database: CINAHL	Experimental Fifty-six adult patients from a central Florida on an inpatient orthopedic unit. Inclusion criteria included age between 45-84, American Society of Anesthesiologists physical status classification 1, 2, or 3, no hearing or visual deficits, communicates in English, admitted to orthopedic floor, alert times 4, and PCA ordered. Exclusion criteria included inability to see VAS, allergy to traditional opioid medications, admission to ICU postoperatively, or hemodynamically unstable. The purpose of this experiment was to find the effects of music just before and after the first ambulation with adult postoperative patients undergoing a total knee arthroplasty on pain perception, anxiety, physiologic parameters, and amount of opioids consumed. Participants listened to 20-minutes of easy-listening music (60-80 beats per minute) before and after their first ambulation. Measurements were taken 20 minutes before, just before, immediately after, 20 minutes after ambulation, and 6 hours after the intervention. Opioid medicine only group received quiet time during the intervention times.	No significant pain reductions were found between groups (F= 1.120, p= .337). Significant pain reduction occurred between T1 and T2 (p= .000). However, music group reported 30% less pain than. Within group anxiety scores were significant between T1 and T2, and T2 and T3 (F= 4.124, p= .011). No significant differences were found between groups (F= 1.566, p= .206). No difference was found between groups in opioid medication usage (Pearson X^2= 0.747, p= .152).	Pain- VAS, McGill Pain Questionnaire Anxiety- VAS Physiologic parameters- portable bedside monitor Listening experience- four question survey
Cole, L. C., & LoBiondo-Wood, G.	Systematic Review	Thirteen studies indicated	Pain- VAS

(2014). Music as an Adjuvant Therapy in Control of Pain and Symptoms in Hospitalized Adults: A Systematic Review. *Pain Management Nursing*, *15*(1), 406-425 doi:10.1016/j.pmn.2012.08.010 LOE: Level 1, High Quality Database: Citation Chasing	Seventeen RCTs were reviewed. Inclusion criteria consisted of RCTs conducted on inpatient setting from January 2005 to March 2011 that were published in English. The purpose of this review was to evaluate evidence that music for pain control on inpatient adults. Cochrane library, MEDLINE, CINAHL, Scopus, and Natural Standard databases were searched using terms music, music therapy, pain, adults, inpatients, hospitalized, and random controlled trials.	significant decrease in pain in the music group (p = .000 - < .05). 2 of 6 studies showed a significant reduction in opioid usage (p = .001 - < .05). 5 of 7 studies showed significantly lower anxiety level in music group (p = .000 - < .04).	
Comeaux, T. & Steele-Moses. (2013). The effect of complementary music therapy on the patient's postoperative state of anxiety, pain control, and environmental noise satisfaction. *MEDSURG Nursing, 22*(5), 313-318. LOE: Level 3, High Quality Database: Proquest	Quasi-Experimental 41 surgical unit patients. Inclusion criteria included anticipated 3 day hospital stay, alert and oriented, 18 years old or older, able to read and write in English, and hematology-oncology diagnosis. Participants were placed on hallways that were assigned music intervention or control. No random assignment took place. Each patient on inpatient surgical units, in halls A and B, were educated and verbally consented to participate in the study. Each participant was given an envelope white envelope containing the STAI, a 4 point- Likert scale pain satisfaction, two standard questions measuring pain control and noise satisfaction. All patients were given prescribed pain medication with the	Time One- State Anxiety (SA) t= 1.112, p = 0.273, Trait Anxiety (TA) t= 1.448, p = 0.156, Pain Satisfaction (PS) t= 1.694, p = 0.098, Environmental Noise Satisfaction (ENS) t= 1.864, p = 0.070. Time Two- SA t= 0.373, p = 0.711, PS t= 3.938, p = <0.001, ENS t= 3.457, p = 0.001 Time Three- SA t= 0.373, p = 0.711, PS t= 3.938, p = <0.001, No differences were found in control group between times. Significant differences were found within the music group from in PS (t= 7.385, p = <0.001) and ENS (t= 4.371, p = <0.001) from time one to time two.	Pain- Standard Satisfaction Questions Anxiety- STAI

	addition of therapeutic music in hall B. Independent T-test was calculated for statistical analysis.		
Economidou, E., Klimi, A., Vivilaki, V. G., & Lykeridou, K. (2012). Does music reduce postoperative pain? A review. *Health Science Journal*, *6*(3), 365-377 LOE: Level 1, Good Quality Database: CINAHL	Mini Systematic Review 6 articles The aim of the study is identify and summarize the effect of music on postoperative pain and analgesic use. The authors searched MEDLINE, Embase, CINAHL, and Cochrane Library for RCTs. Inclusion criteria was adults undergoing major elective surgery, under general anesthesia requiring postoperative pain relief such as a PCA or analgesic therapy.	Choice of music, timing, and duration of intervention varied among the results. VAS scores were significantly lower ranging 0.9m -1.7m. Four studies demonstrated lower opioid use ranging 1.1m – 2.8m.	Pain- VAS
Good, M., Albert, J. M., Anderson, G.C., Wotman, S., Cong, X., Lane, D., & Ahn, S. (2010). Supplementing relaxation and music for pain after surgery. *Nursing Research, 59*(4), 259-269. doi:10.1097/NNR.0b013e3181dbb2b3 LOE: Level 2, High Quality Database: CINAHL	Experimental 2x2 Factorial Design Pretest-Posttest Purposive sample of 517 patients aged 18-75 years scheduled for major abdominal surgery. Four interventions were included preoperative patient teaching (PT), relaxation and music (RM), PTRM, and quiet time while the intervention is being completed. PT included teaching about sensory information, reporting pain on pain scale, managing pain during activity, attitude modification, and participation in management of pain. RM included jaw relaxation with sedative music in background chosen by patient from six choices. PTRM was the combination of these techniques. The control group was	There were significant findings on day 1 am (6mm less pain, p = < .001), pm (1mm less pain, p = .04), and day 2 am (3mm less pain, p = .04). RM also significantly decreased sensation (10mm less, p = < .001) and distress (10mm less, p = < .001) on day 1 am measure. Day 2 am measure was also significant in decrease of sensation (1mm less, p = .04). No other significant findings were reported. RM did not impact the amount of opioid intake during the study. PT did not result in lower pain scores. PTRM showed a significant decrease in pain compared to PT alone. PTRM also showed a	Pain- VAS

	given quiet time during the intervention time. Introduction to the interventions were given preoperatively, 20 minute tests were completed on day of surgery, and 60 minute taped interventions were completed at 10 a.m. on days 1 and 2 on postsurgical nursing unit. Pretest-posttest pain, pulse, respirations, and milligrams of opioid received were measured at 8 a.m., 12 noon, 4 p.m., and 8 p.m.	significant decrease in pain over the control on day 1 especially. Some limitations found were missed data during the study. These missed data points may have changed the outcomes slightly.	
Hole, J., Hirsch, M., Ball, E., & Meads, C. (2015). Music as an aid for postoperative recovery in adults: a systematic review and meta-analysis. *Lancet*, *386 North American Edition*(10004), 1659-1671 doi:10.1016/S0140-6736(15)60169-6 LOE: Level 1, Quality A Database: CINAHL	Systematic Review and Meta-analysis 260 articles, 73 RCTs The aim of the study was to identify and summarize the findings of music intervention on pain, anxiety, and analgesic use in the literature. Authors searched MEDLINE, Embase, CINAHL, and Cochrane Central for articles and RCTs. Inclusion criteria for evidence search was any language with adult patients undergoing any form of surgical procedure to any part of the body excluding the CNS, head, or neck. Authors compared any form of music provided before, during, and after the procedure. The authors focused on postoperative pain, analgesia needs, anxiety, infection rates, wound healing, costs, length of stay, and satisfaction of care as outcomes.	Choice of music, timing, and duration of intervention varied among the results. Music reduced postoperative pain SMD -0.77, CI 95% in 45 RCTs including reduced VAS score 23mm. Music reduced analgesic use -0.37 in 34 RCTs. Anxiety was reduced SMD -0.68 in 43 RCTs including STAI scale reduce of 6.4 units. Patient satisfactions scores increased 1.09. Length of stay was not affected with reduction of SMD -0.11.	Pain- VAS, Numerical Rating Scale (NRS)
Lin, P., Lin, M., Huang, L., Hsu, H., & Lin, C. (2011). Music therapy for patients receiving spine surgery.	Quasi-Experimental Design Pretest-Posttest	Music group average (avg.) VAS anxiety scores 0.8 (SD 1.3) to 2.0 (SD 2.1). Control group avg.	Pain- VAS Anxiety- VAS, STAI

Journal of Clinical Nursing, *20*(7/8), 960-968. doi:10.1111/j.1365-2702.2010.03452.x LOE: Level 3, High Quality Database: CINAHL	60 non-emergent scheduled spinal surgery in a medical center in Taipei City, Taiwan. Inclusion criteria were >18 years old, no mental or cognitive impairment, ability to communicate, and willingness to participate in study. The aim of this study was to evaluate the effects of music therapy on anxiety, pain, and physiological reactions in patients undergoing spinal surgery. Music therapy is songs 60-72 beats per minute in mid- to low-pitch, soft melodies in Chinese and Taiwanese including pop, classical, nature, and sacred music. Music was delivered using an MP3 player with ear buds. Anxiety was measured using State-Trait Anxiety Inventory (STAI), VAS, and physiological measures. Pain was measured using the VAS. Blood pressure (BP) and pulse were measured using a automatic measuring machine. Cortisol levels were collected by blood and urine samples. Participants listened to music for 30 minutes at 7p.m. the day before surgery, one hour before surgery, and 3 p.m. on postoperative days 1 and 2. VAS scores and vital signs were collected pretest and posttest. The STAI was completed on the evening before the surgery and postoperative day 2. Urine was collected 7 p.m. the day before surgery and 7 a.m. on postoperative day 3. Data was collected in the control group at the same times as the study group, however quiet time was provided for 30	VAS anxiety scores ranged 2.1 (SD 1.9) to 5.1 (SD 2.7). These were significant within and between groups with p = 0.018 – 0.001). Music group STAI mean scores preoperative were 38.1 (SD11.5) and postoperative 38.2 (8.9). Control group STAI mean scores were preoperative 43.3 (SD 11.2) and postoperative 40.6 (8.2). These scores were non-significant changes within or between groups (p= 0.074 – 0.286). Music group avg. pain scores ranged 1.7 (SD 1.5) to 3.0 (SD 2.3). The control group pain scores ranged 4.4 (SD 1.9) to 6.0 (SD 2.5). These scores were significant with p = 0.001.	

	minutes.		
McCaffrey, R., & Locsin, R. (2006). The effect of music on pain and acute confusion in older adults undergoing hip and knee surgery. *Holistic Nursing Practice*, *20*(5), 218-226 LOE: Level 1, Good Quality Database: Citation Chasing	RCT Design 124 Adults over 65 years of age. Inclusion criteria was elders over 65 years old, undergoing elective knee or hip surgery that are alert and oriented to provide surgery consent, and are able to hear music. The purpose of this study was to evaluate the effect of music on postoperative pain, cognition, ability to ambulate, and patient satisfaction. Participants were randomly assigned postoperatively on the inpatient unit. CD players automatically played one hour of music 4 times per day with music chosen by the patient. Music was encouraged additional times that included these 4 automatic times. After discharge the main researcher reviewed the chart records to retrieve the data including pain scores, readiness to ambulate scores, mean number of feet ambulated, patient satisfaction. Confusion and delirium were assessed counted by reviewing the nurses' narrative note	ANOVAs were calculated to analyze the data. A significant reduction in use of pain medication in the music group was reported with ANOVA comparison f= 26.93 and p = 0.001. Mean music pain scores ranged from 4.63 to 7.83. Mean control pain scores ranged from 7.40 to 8.90. ANOVA comparison for day 1 was f= 12.69, day 2 f= 25.54, and day 3 f= 35.90 all with p = .001. Music group also had significantly fewer acute episodes of confusion f= 29.56, p = .001. Readiness-to-ambulate was significantly higher in music group scoring 38.14, p = .001. Music group ambulated significantly more feet with mean range of 40.17ft to 67.17ft. Control group mean range was 27.17ft to 46.67ft. Day 1 f= 17.59, Day 2 f= 33.68, Day 3 f= 18.84 with p = .001. Music group reported significantly higher mean satisfaction scores of 9.60 to the control group 6.83 (f= 96.00, p = .000).	Pain- Likert numerical scale
Singh, A. (2015). Post-operative pain management: Nursing interventions [Recommended Practice]. Retrieved from	Systematic Review- Clinical Guideline The sample was a systematic review of 29 RCTs with meta-analysis. A second	Best Practice Recommendations include a grade B encouraging nurses to use music as an adjuvant post-operative pain	Pain- Various

http://ovidsp.tx.ovid.com.ezproxy.valpo.edu/sp-3.24.1b/ovidweb.cgi?&S=DKBKFPLBAKDDGCCANCHKBHDCMOKEAA00&Link+Set=S.sh.40%7c18%7csl_190 LOE: Level 1, Good Quality Database: The Joanna Briggs Institute	systematic review of 14 studies and four quasi-experimental studies. A prospective consecutive cohort study of 193 participants. A prospective RCT of 41 participants. The purpose of this review was to find the best available evidence for effective nursing interventions to reduce postoperative pain in adults.	therapy. Grade B was also given for allowing clinical judgment when deciding pain interventions when considering side effects, risk for adverse events, and patient needs and preferences.	

Scale (VAS) 0 to 10. Pain was reported every 30 minutes or every 60 minutes for the first 24 hours, every 3 hours during 2nd day, every 15 minutes until discharge from PACU, or at times agreeable to subjects. The results were clearly presented in the results section and in table form. The authors concluded that music therapy significantly reduces postoperative pain across all studies in this review. The results include VAS score differences between groups range from 0.3 to 1.6 mm. Four of the six studies resulted in a significant decrease opioid usage ranging from 0.8 to 2.8. Significance levels and description of results are reported for each article. The authors provided an in-depth interpretation of the findings however limitations are not included in this review. Critically appraising this article, it is a level one on the Melnyk-Fineout-Overholt hierarchy and good quality using the JHNEBP tool.

Hole et al. (2015) completed a systematic review and meta-analysis with the purpose of assessing if music improves postoperative pain after surgical procedures. The inclusion criteria for articles included RCTs in any language with adults undergoing surgical procedures to any part of body excluding central nervous system, head, or neck. Music and any other non-drug adjuvant therapy with standard of care initiated before, during, or postoperatively was considered. The authors focused on outcomes of pain, analgesia needs, anxiety, infection rates, wound healing, costs, length of stay, and satisfaction of care. The literature search included MEDLINE (January 1, 1946 – October 1, 2013), Embase (January 1, 1947 – October 1, 2013), CINAHL (January 1, 1960 – October 1, 2013), and Cochrane Central (January 1, 1898 – October 1, 2013). MeSH terms used for these searches included surg*, operat*, recovery, recuperation, rehabilitation, convalescence, or post-op*. Seventy-three studies met the inclusion criteria and one study was excluded due to qualitative results. The standardized mean differences (SMD) were calculated to standardize the outcomes of the various results. The authors reported the music reduced postoperative pain in 45 RCTs (SMD -0.77, CI 95%, range from -0.99 to -0.56). Pain scores were, on average, were reduced by 23mm (95% CI) over the standard of care. In 43 studies, music was reported to decrease anxiety (SMD -0.68, -0.95 to -

0.41). Scoring on the STAI for anxiety was reduced on average 6.4 units. Music was also shown to decrease analgesic use in 34 RCTs (SMD -0.37, -0.54 to -0.20). Sixteen studies revealed music increased patient satisfaction scores (SMD - 1.09, 0.51 to 1.68). Music was not shown to affect length of stay in the hospital. When patients are allowed to choose their music, a non-significant decrease in pain and increase in anxiety was noted. Music had the largest affects on reducing pain when play preoperatively (SMD -1.28), then intraoperatively (SMD -0.89), and postoperatively (SMD -0.89) with a single patient experience. In the same fashion, the largest reduction of anxiety followed the pattern preoperatively (SMD -1.12), intraoperatively (SMD -0.83), and postoperatively (SMD -0.50). Analgesic use was also maximally reduced with the same pattern of music intervention: preoperatively (SMD -0.43), intraoperatively (SMD -0.41), and postoperatively (SMD -.27). According to the evidence pyramid and JHNEBP tool, this study is a level one in the hierarchy of evidence and high quality.

Singh (2015) also performed a systematic review with the purpose of finding the best available evidence regarding nursing interventions in reducing or relieving postoperative pain in adults. Twenty-nine RCTs with meta-analysis, 14 RCTs single studies, four quasi-experimental studies, a prospective cohort study, and a prospective RCT study was included in this review. Music was found to be an effective adjuvant therapy for pain relief. A majority of these the examples found in review consisted of instructions to the participant on how music affects pain, how and when to use music, and how to appropriately move to reduce pain. The author also noted patient assisted epidural (PAE) infusion significantly reduced pain over continuous epidural infusion, pleasant imagery significantly reduced pain over preoperative education, and patient using self-care reported reduced pain over routine care patients. Healing touch and nurse-driven protocol for nurse's administration of analgesic medication without physician consult also led to significantly reduced pain scores. Best practice recommendations included encouraging nurses to use music as an adjuvant therapy for postoperative pain relief with a grade B. Clinician judgment is recommended that accounts for side effects, risk of adverse

events, and patients' needs and preferences with a B grade. According to the Melnyk-Fineout-Overholt pyramid and JHNEBP tool, this study is a level one in the hierarchy of evidence and high quality.

Level two. Allred et al. (2010) compared listening to music and quiet rest affect on pain and anxiety on postoperative adults with total knee arthroplasty before and after their first ambulation with physical therapy. The authors also measured physical parameters including mean atrial pressure (MAP), heart rate, respiratory rate, and oxygen saturation levels. The sample include 56 patients randomly assigned, ranging in age 45 to 84, spoke English, no visual or hearing deficits, and classified with physical status of 1, 2, or 3 according to American Society of Anesthesiologists. They were also alert and oriented to person, place, time, situation, and were on a postoperative controlled analgesia (PCA) for pain relief. A power analysis was completed resulting in power of 0.80 and $\alpha = 0.05$, which indicates large effect and an adequate sample size. A visual analog scale (VAS) was used to measure pain and anxiety. The McGill Pain Questionnaire (MPQ) was also used to measure pain in sensory, affective, and evaluative dimensions. Physiologic parameters were measured using a portable bedside monitor. The author's music intervention was easy listening music using a compact disc (CD) play with headphones. The music did not have lyrics and measured 60-80 beat per minute. The intervention was given 20 minutes before and 20 minutes after the initial ambulation. The quiet group was provided quite rest periods during these times. Measures were collected 20 minutes before ambulation (T1), just before ambulation (T2), immediately after ambulation (T3), 20 minutes after ambulation (T4), and 6 hours after intervention (T5). Results were calculated using the repeated measures analysis of variance (RMANOVA). Significant pain reductions in both groups were found ($F = 6.713$, $p = .001$) between T1 and T2 ($p = .000$) and T2 and T2 and T3 ($p = .000$). VAS pain scores were not significantly different between groups ($F = 1.120$, $p = .337$), however the authors noted that pain levels were 12% lower in the music group during these timed intervals. Anxiety scores followed a similar pattern ($F = 4.124$, $p = .011$),

decreasing over the time of measures (T1 and T2- $p = .035$, T2 and T3- $p = .014$). However, no significant differences were found between the groups ($F = 1.556$, $p = .206$), yet anxiety scores were 12% lower in the music group during these timed intervals. MAP measurements continued this trend of significant differences ($F = 9.891$, $p = .000$) over time intervals (T1 and T4- $p = .001$, T2 and T4- $p = .047$) but lacked significance between groups ($F = .338$, $p = .658$). The authors also reported opioid use following the intervention. There were no differences between groups $X^2 = 0.747$ with $p = .388$. The authors reported that 93% of music group and 86% of quiet group received oral pain medications within 6 hours of the intervention. Survey questions were included to evaluate patient perception to listening to music. These results included 84% reported music helped them forget about their pain, 92% reported improvement in mood due to music, and 88% found music enjoyable. While this study does not provide significant differences between the groups, the music intervention did result in lower pain and anxiety scores overall. One limitation the authors reported that quiet time ended up being an intervention. This study provides evidence that adjuvant pain therapy, whether music or resting periods, help with the recovery process aiding in the control of postoperative pain. Critically appraising this article, it is a level two on the Melnyk-Fineout-Overholt hierarchy and high quality using the JHNEBP tool.

Good et al. (2010) completed a single study experiment with a 2 x 2 factorial design comparing patient teaching (PT) of pain management, relaxation and music (RM) therapy, combination of patient teaching and relaxation and music therapy (PTRM), and provider ordered analgesic alone. The purpose of this study was to compare PT and RM effects on postoperative pain. This single study sample size was large with 517 participants, which is appropriate for the design and the generalization of results. Participants were randomized into one of four groups; PT, RM, PTRM, and analgesic only. PT was provided to participants before surgery recorded for 5 to 10 min on tapes for them to listen and during postoperative days. PT content included sensory information, information on reporting pain, obtaining medications,

preventing pain, managing pain during activity, modifying attitudes, and participating in pain management. RM consisted of jaw relaxation techniques with choice of sedative music in background. An introduction tape was used to teach this technique to the participants. Participants were given a choice between six genres of music including synthesizer, piano, harp, orchestra, slow jazz, and inspirational. No music contained lyrics but included 60-80 beats per minute, strong rhythms, volume, and percussion. The RM alone group did not receive the pain education. The PTRM group received the teaching before surgery and during the postoperative period as well as the relaxation and music therapy. The control group was provided quiet time during the periods of intervention. Pain was measured using a VAS 100mm scale while pain medication used was measured in milligrams as documented in the medical record. Additional measures were used to collect how participants used the music, how the liked the music, and whether the tape made them sleepy. HR and respirations (RR) were also counted and recorded. Introduction to the interventions were given preoperatively, 20 minute tests were completed on day of surgery, and 60 minute taped interventions were completed at 10 a.m. on days 1 and 2 on postsurgical nursing unit. Pretest-posttest pain, pulse, respirations, and milligrams of opioid received were measured at 8 a.m., noon, 4 p.m., and 8 p.m. They reported RM and PTRM groups reported decreased pain during every measure compared to PT or control group. When authors compared RM to control group three out of five measured times were significantly lower pain in the music group (day 1 a.m.- $F = 7.03$, $p = .001$; day 1 p.m.- $F = 2.59$, $p = .04$; day 2 a.m.- $F = 3.23$, $p = .02$). When the PTRM was compared to RM, there were no significant differences between groups. When PTRM was compared to control significant lower pain scores were found on day 1 ($F = 9.38$, $p = < .001$) and day 2 ($F = 2.54$, $p = .04$) in the a.m. There were no significant differences found in pain scores when comparing PT and control group. When comparing PTRM to PT significantly lower pain scores were found on day 1 ($F = 3.37$, $p = .02$) and day 2 ($F = 3.37$, $p = .02$) in a.m. PTRM and RM also resulted in significantly lower sensation and distress scores over PT alone and control. RM seems to be a significant

factor that reduces pain due to significant results reducing pain in RM and PTRM over the other groups. The authors provided many limitations that might improve their study and future studies. Some of the limitations reported included using tape players instead of MP3 players, reviewing patient goals, and studying the knowledge of the patient prior to the PT intervention. Critically appraising this article, it is a level two on the Melnyk-Fineout-Overholt hierarchy and good quality using the JHNEBP tool.

McCaffrey and Locsin (2006) performed a single RCT study to examine how music therapy affects older adults undergoing hip or knee surgery. The authors studied the effects of music on postoperative pain, cognition, ability to ambulate, and patient satisfaction. They sampled 124 participants from the Florida Atlantic University Hospital over 65 years old, undergoing hip or knee surgery, alert and oriented preoperatively, and able to hear music. The participants were randomized into the music intervention or control groups. Each group was given provider ordered analgesic medication with the only difference of the music intervention. The author's quantified subjective pain using a 10-point Likert scale, pain medications consumed during the hospital in milliliters or milligrams, ambulation in feet, and a 10-point Likert scale for overall patient satisfaction. Each member of the music group was given a bedside CD player in which the participants could choose from 40 types of music. The CD player automatically played music 4 times daily and results were taken from the nursing assessments and charted information. These results were found in the patient chart following discharge and ANOVA calculations were made to quantify the results. The music group reported decreased pain scores on day 1(f = 12.69, p = .001), day 2 (f = 25.54, p = .001), and day 3 (f = 35.90, p = .001). The music group mean score for satisfaction was 9.60 while the control group was 6.83. Pain scores ranged from 4.63 to 7.83 in the music group and 7.40 to 8.90 in the control group. Music group also had lower amount of confused episodes (f= 29.56, p= .001), higher scores for readiness to ambulate (f = 38.14, p = .001), and higher satisfaction scores (f = 35.90, p = .001). The authors reported the only 2 out of 38 participants who had confusion were part of the music

group. The music was also able to ambulate significantly further on day 1 (f = 17.59, p = .001), day 2 (f = 33.68, p = .001), and day 3 (f = 18.84, p= .001). They also concluded that music therapy is a safe, inexpensive, and easy to use method to help control pain. The authors did not provide limitations but recommended that further study is needed to confirm the relationship between decreased acute confusion and music therapy. According to the Melnyk-Fineout-Overholt hierarchy and JHNEBP tool, this study is a level two in the hierarchy of evidence and high quality.

Level three. Comeaux and Steele-Moses (2013) completed a quasi-experimental non-equivalent control group designed study. The purpose of their study was to determine if music effectively reduces anxiety, increase pain management satisfaction, and increase environment noise satisfaction. Forty-one admitted patient to the Our Lady of the Lake Regional Medical Center inpatient surgical unit, who met the inclusion criteria, were placed in hallway A (control group) or hallway B (music group). The inclusion criteria included anticipated 3-day hospital stay, alert and oriented, age 18 or older, able to read and write English, and hematology-oncology diagnosis. Both groups received provider ordered analgesia. The music intervention consisted of non-lyrical preprogrammed music using MP3 players for 30 minutes following administration of prescribed analgesia. Measures used for data collection included STAI, and two standardized questions concerning pain management and environment noise satisfaction. Participants were asked, “During the previous 24 hours, I am satisfied with my pain control” and “During the past 24 hours, I am satisfied with the noise level in and around my room?” A vendor provided these questions with reliability and validity (r = 0.72, r = 0.74, respectively). These questions were rated on a 4-point Likert scale ranging from 1 (not at all) to 4 (very much so). Each participant was given a data collection packet that included the three STAI and three survey forms for the participants to complete on each day of their hospital stay. These were collected upon discharge from the unit. The authors reported no significant difference between groups was found on day one. A significant increase was reported in pain satisfaction (t =

3.938, p = <0.001) and noise satisfaction (t = 3.457, p = 0.001) in the music group on day 2. No significant difference was found between groups with state anxiety scores (t = 0373, p = 0.711). The authors calculated a difference over time within each group. There was no significant difference from day one to day two in the control group (state anxiety- t = 0.149, p = 0.883, pain- t = 0.237, p = 0.815, noise- t = 0.568, p = 0.576). The music group reported significantly increased pain and noise satisfaction scores (pain- t =7.385, p = <0.001, noise- t = 4.371, p = <0.001) and no difference in state anxiety (t = 1.47, p = 0.159). Due to the oncology diagnosis and treatment, the authors think this may play a roll in impact that music had on anxiety in this study. The music did impact satisfaction of pain and noise scores overtime, which was originally predicted by the others. One complication was construction was down hallway B, the intervention hallway, which may have affected the scores on day one. Critically appraising this article, it is a level three on the Melnyk-Fineout-Overholt hierarchy and good quality using the JHNEBP tool.

Lin et al. (2010) completed a single quasi-experimental study with the purpose of evaluating the effects of music on anxiety, postoperative pain, and physiological reactions to emotion and physical distress in patients undergoing spinal surgery. The sample size for this study was 60 Taiwanese patients from a medical center in Taipei City. Inclusion criteria for participants were age 18 years and older, no mental or cognitive impairment, ability to communicate and willingness to participate. The participants were randomly assigned to the music or control groups using a coin flipping method. The intervention for this study is therapeutic music, which consists of 60-72 beats per minute using soft melodies provided by a MP3 player. Participants in the music group were able to choose from pop music, cultural, sounds of nature, or sacred music. The intervention was completed on 7pm the night before surgery, one hour before surgery, and 3pm the first and second postoperative days for 30 minutes. Each group was treated using provider ordered analgesic medications with the exception of music intervention. Measures used to collect data included VAS to measure

anxiety and pain, STAI, and bedside monitor (BP, HR, and mean BP). Additional measurements included measuring cortisol, norepinephrine, and epinephrine by collecting a 24-hour urine sample. The music group reported significantly lower anxiety and pain compared to the control group across all recorded VAS measurements. The average pain score of the music group ranged from 1.7 to 3.0 while the control group reported average scores of 4.4 to 6.0 (p= 0.001, among all measures). VAS anxiety scores of the music group ranged from 0.8 to 2.0 while the control group reported 2.1 to 5.1 (p= 0.018 – 0.001). The authors conclude that music therapy helps lowers subjective reports of pain and anxiety and mean blood pressure after surgery. STAI was not significantly different within or between groups. Music groups also had lower-systolic (p= 0.007) and mean BP (p= 0.014). There were no significant differences found in HR, cortisol, norepinephrine, or epinephrine levels between groups. Study limitations and recommendations included lower number of female patients due to the hospital setting being a veterans hospital, limited expression of emotion due to the Chinese culture, and they call for furthering this research with a larger sample size. According to the evidence pyramid and JHNEBP tool, this study is a level three in the hierarchy of evidence and good quality.

Construction of Evidence-based Practice

Synthesis of Critically Appraised Literature

Therapeutic music has consistently shown, in these selected studies, to improve postoperative pain when used in combination with analgesic medications. This evidence also shows good quality with significant results in a multitude of surgeries including abdominal, spinal, and joint replacement. Music has also been effective in reducing anxiety, normalizing physiologic parameters, increasing patient satisfaction, and improving mobility (Good et al., 2010; Lin et al., 2010; McCaffrey & Locsin, 2006). As referenced above, therapeutic music is cost effective with no side effects noted and requires no training of staff (Allred et al., 2010; Economidou et al., 2012; Good et al., 2010; McCaffrey & Locsin, 2006). Nurses and patients can easily carry out this therapy in the hospital and clinical setting effectively.

Best Practice Model Recommendation

According to this literature review, best practice recommendations include music to be played throughout the perioperative experience. Music should play before, during, and after surgical interventions. Therapeutic music should consist of a calming nature, 60-80 beats per minute, and last for at least 30 minutes at a time. During the postoperative period, three times per day has been very effective.

CHAPTER 3

IMPLEMENTATION OF PRACTICE CHANGE

The implementation of therapeutic music as an intervention in postoperative spinal patients occurred over a three-month period (September 15 through December 21). The purpose and goal of this EBP will be to verify the effectiveness of therapeutic music in pain management among postoperative spinal patients leading to implementation of music in a standardized protocol for all postoperative patients.

Participants and Setting

The implementation of this EBP project occurred at a 30-bed, physician owned; for-profit medical center located in Northwest Indiana. The hospital serves a diverse patient population due to the broad geographic area that includes many rural cities. The community reputation, available services, access to a major interstate highway, and insurance coverage are other major factors allowing for a broad spectrum of clients.

A convenience sampling of subjects included patients aged ≥ 18 years that have undergone lumbar spinal surgery (ICD-10 Code M43.22) with hospital stay of at least four days. This project compares pain scores and opioid medications consumed on all participants on postoperative days three and four between the dates of September 15, 2016 through December 21, 2016.

Outcomes

This project focused on two primary outcomes; pain scores and amount of pain medications utilized by the patient. The pain score will be vocalized by the patient using a 10-point VAS and recorded in the electronic medical record (EMR) as per hospital protocol by nursing staff. Medication amounts will be evaluated by reviewing EMR charting of the times and amount of medication given to the patient.

Intervention

Using the EBM model to change current practice, a literature search was first performed to identify the best practice of therapeutic music. When the literature was synthesized, an integrated process for therapeutic music was developed. All postoperative spinal patients would receive therapeutic music on day four of their inpatient hospital stay. With a choice from six genre stations to choose, patients will listen to music three times on day four (before lunch, dinner, and 10:00 p.m.) for at least 30 minutes per session. These six genre stations include nature sounds, country, pop, classical music instrument only, rhythm and blues, and rock.

Nursing staff was educated about therapeutic music regarding benefits to pain management when combined with analgesic pain medications. Staff will be given the list of music genres and song tempo restrictions of 60-80 beat per minute to help clarify the type of music that is considered therapeutic according to the evidence. Education took place during a monthly staff meeting when all nurses and aides could attend. The main investigator presented the research and policy change at that time. Two floor nurses were recruited as co-investigators. They were given in-depth training regarding the policy change and completed National Institute of Health (NIH) training “Protecting Human Research Participants”. One co-investigator was assigned to review and collect participant signatures of the informed consents during pre-operative appointments. The second co-investigator provided help to ensure the policy was followed when the main investigator was not present during days three and four.

Nursing staff charted pain scores and provided pain medications as scheduled by the physician or as desired by the patient if as needed (PRN) medications were ordered. The main investigator performed weekly chart audits to document demographic information, vital signs, pain scores, and medication given during the two days of interest.

Planning

The main investigator developed this project over two years reviewing and analyzing the hospital patient satisfaction scores and researched CAM pain therapies for adjuvant use during the postoperative period. The main investigator submitted this project idea to hospital

administration to create a potential nursing protocol to improve use of CAM pain therapies during postoperative inpatient hospitalization. Utilizing therapeutic music matches the holistic approach to care in the mission and vision statements of the hospital. Pain management is also one of their lowest scores on the patient satisfaction survey (Medicare, 2015).

After completing the literature search, the best evidence was brought to the CNO and reviewed by the surgeon for approval. Permission was given to complete the investigation at the hospital and create a policy to incorporate therapeutic music in postoperative care plans.

Data

Measures

Data was collected through chart audits using both the IQTEE and Paragon EMR systems. Reliability is a concern due to the subjectivity of the patient responses and nurse recording the assessment. To help strengthen reliability and validity, the main investigator focused recording pain scores around the same assessment times for each participant. To minimize bias, the co-investigators will review the protocol used by the main investigator to record data.

Collection

Weekly chart audits for data collection took place from September 1, 2016 through December 21, 2016. The data obtained by the main investigator requires individual chart audits to retrieve demographic data, pain scores on postoperative days three and four, and total amount of opioid medications given on postoperative days three and four. Vital signs will also be recorded and analyzed on days three and four.

Management and Analysis

The main investigator was the only member of the investigating team to collect data from the charts, making him responsible for the safety and protection of the healthcare information. The data was compared between postoperative days three (pre-implementation) and four (post-implementation). The data was analyzed using SPSS software and paired *t* test. The variables

of focus during this project included therapeutic music as the independent variable while pain, vital signs, and amount of medication were dependent variables.

Protection of Human Subjects

This DNP project was submitted to the Valparaiso University Institutional Review Board (IRB) to ensure that the participants are protected. After receiving IRB approval, the project proposal was submitted for review by hospital administration, the surgeon, and board of directors for their approval. To maintain confidentiality, data was free from patient identifiers and stored in a password-protected computer or locked in a file folder.

CHAPTER 4

FINDINGS

Pain reduction during the postoperative period has been shown to yield improved surgical outcomes. This EBP project utilized therapeutic music during the postoperative period to verify that reduce pain scores and decrease the amount of PRN opioid pain medication. The PICOT question of focus was, “Do adult postoperative spinal patients, who use therapeutic music on postoperative day four, report reduced pain scores and require less opioid medication compared to day 3 without music at a small Midwest physician owned hospital?” After completing the implementation phase of this project, data analysis was completed that included participant characteristics and implementation outcomes.

Participants

Size. There were 39 surgical candidates, all >18 y/o, that qualified for this EBP project from September 1, 2016 to December 20, 2016 that presented for pre-operative appointments at a small Midwest physician owned hospital. Each participant would receive standard postoperative pain management without music on day 3 and therapeutic music was added on day 4 of their inpatient hospital stay. Thirteen participants were removed from this project. One candidate refused to be part of the project during the pre-operative appointment. Two participants were removed due to hospital discharge on day three. Seven participants were removed due to discharge before 1500 on day 4. One participant was removed from the project due to complications following surgery. Two participants decided to drop out of the project during the recovery process. Therefore, 26 participants completed the therapeutic music procedure and were included in the chart audit.

Characteristics. The genders of the participants (N=26) included 14 males and 12 females (see Figure 4.1). Race was unequally distributed among the participant population including 23 Caucasian, 1 African American, and 2 Hispanic. There was a wide range of ages among the participants from 33-69 (see Figure 4.2).

Smoking status was also recorded including 13 reported as current smokers, 9 reported as non-smokers, and four reported as former smokers. More than 44% of participants were currently employed while 55.6% reported being currently unemployed. Religious affiliation was recorded if the participant reported this throughout their hospitalization. Forty-two percent of the participants reported to be of a Christian denomination while 58% did not affiliate with a specific religious preference. Martial status was also analyzed as follows 65.3% reported as married while 34.7% reported as divorced or widowed.

Figure 4.1. Gender Distribution

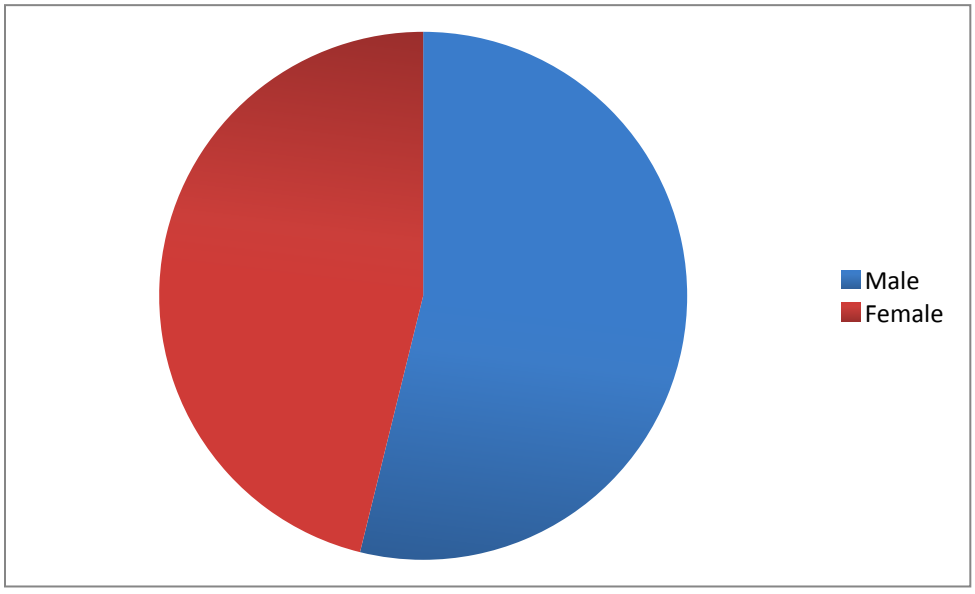


Figure 4.2. Age Distribution

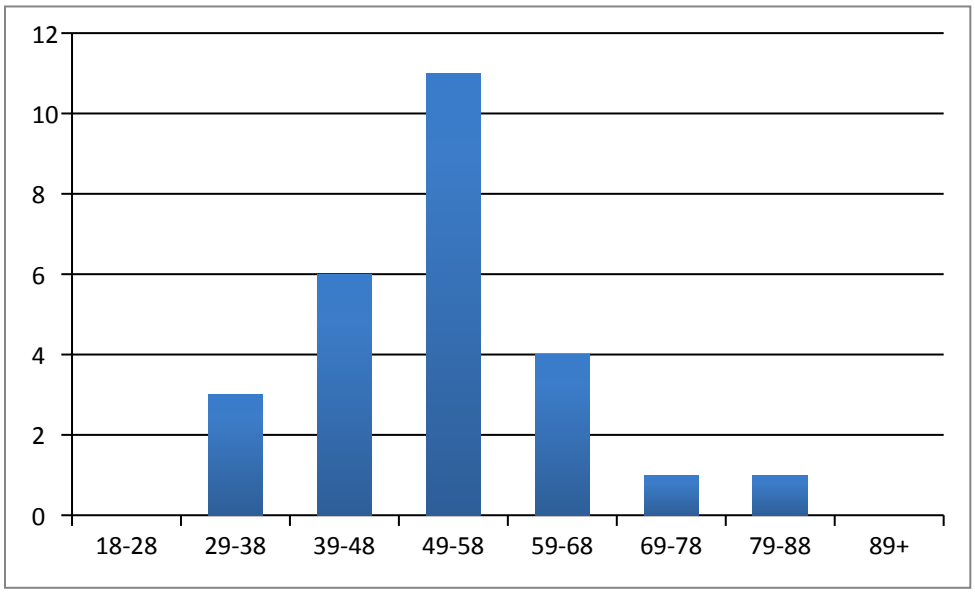
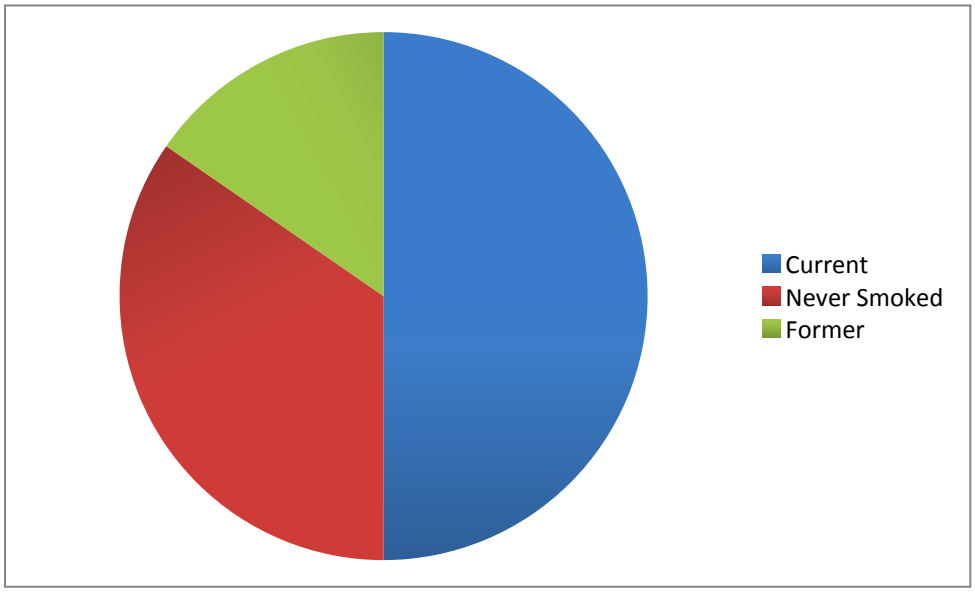


Figure 4.3. Smoking Status



Changes in Outcomes

Statistical Testing. Data was entered into the Statistical Package for the Social Sciences (SPSS) for statistical analysis. A t-test was performed to compare pain scores and medication quantities of pre and post implementation of therapeutic music. Additional analysis focused on a secondary outcome of changes in physiologic parameters.

Significance

Primary Outcomes

Pain. All pain scores were measured using the 10-point VAS. The VAS pain scale is a 10-point rating scale, which is posted in every patient room and allows patients to point to a spot on a line that can be measured to determine a value. This scale is measured from 0 (no pain) to 10 (worst pain possible). The VAS shows good convergent validity with an intraclass correlation coefficient between 0.95 and 0.98 (Bijur, Silver, & Gallagher, 2001). Pain scores were recorded in three 8-hour increments (0700 – 1500, 1501 – 2300, and 2301 – 0700). The mean of these pain scores were calculated and compared between day 3 and 4. Any participants discharged after 1600 on day 4, discharge pain scores were recorded as 2301-0700. The mean day 3 pain scores were (M = 5.769, SD = 1.945; M = 5.692, SD = 1.954; M = 5.692, SD = 2.112) compared with day 4 scores with corresponding times (M = 5.115, SD = 2.268; M = 4.846, SD = 2.110; M = 4.846, SD = 2.344) (see Figure 4.4). A paired samples t-test was performed for day 3 and 4 comparing scores within the same shifts ($t(25)$ = 2.516, $p < .05$; $t(25)$ = 2.590, $p < 0.5$; $t(25)$ = 2.008, $p > .05$) (see Figures 4.4 and 4.6). A paired t-test was also calculated comparing day 3 pain score 1 and day 4 pain score 3 ($t(25)$ = 1.935, $p > .05$).

A Pearson correlation was also calculated to analyze the linear association of the pain scores. The correlation compared day 3 and day 4 at each time interval (r = .813, $p < .001$; r = .667, $p < .001$; r = .539, $p < .01$ respectively).

Medication Quantity. Medications were retrieved from the EMR system. The quantity in total amount in milligrams (mgs) was recorded. These totals were then converted into

morphine equivalents for accurate comparison as several different opioids were used to treat pain. The mean scores were calculated and compared between postoperative days 3 and 4. Medications given after 1600 on day 4 during the discharge were recorded as 2301-0700. The mean medication amounts were compared resulting in day 3 (M = 37.673, SD = 45.008; M = 35.682, SD = 33.506; M = 35.798, SD = 37.313) and day 4 (M = 37.172, SD = 47.161, $t(25)$ = .103, $p > .05$; M = 29.961, SD = 35.748, $t(25)$ = .806, $p > .05$; M = 31.451, SD = 37.437, $t(25)$ = 1.135, $p > .05$) (see Figure 4.5 and 4.6). Medication given during day 3 at time interval1 was compared to day 4 time interval 3 ($t(25)$ = 1.281, $p > .05$).

A Pearson correlation was also calculated to analyze the linear association of opioid medication usage. The correlation compared day 3 and day 4 at each time interval (r = .857, $p < .001$; r = .456, $p < .05$; r = .864, $p < .01$ respectively).

Secondary Outcomes

Physiologic Parameters. Physiologic parameters included BP, pulse, respirations, and temperature, which were recorded three times on postoperative days 3 and 4. Physiologic parameters were also broken into 8-hour increments 0700-1500, 1501-2300, and 2301-0700. The earliest set of vital signs for each time period was recorded and the means of each parameter was compared between day 3 and day 4. If a participant was discharged after 1600 on day 4, discharge vital signs were recorded as 2301-0700. Descriptive statistics were calculated and presented in ***table* 4.1**.

Pearson correlation and paired t-test were also calculated to analyze the linear association of each physiologic parameter and find differences between the means. The correlation compared day 3 and day 4 at each time interval. Correlational significance was only found with pulse rates (r = .857, $p < .001$; r = .456, $p < .05$; r = .864, $p < .01$ respectively). The t-tests were statistically insignificant.

Table 4.1. Day 3 Physiologic Parameters

Measure	*M*	*SD*	Measure	*M*	*SD*
Systolic	126.5	13.89460	Respirations	16.7308	2.03091
Systolic	120.8077	12.90587	Respirations	16.6923	2.24088
Systolic	119.3846	10.74459	Respirations	16.5385	1.30325
Diastolic	67.5769	8.14947	Temp (F)	98.2038	.49029
Diastolic	64.7692	6.76643	Temp (F)	98.1577	.51627
Diastolic	66.4615	8.02113	Temp (F)	98.2308	.44968
Pulse	87.8462	13.04053			
Pulse	85.1923	12.30291			
Pulse	84.2308	12.39454			

Table 4.2. Day 4 Physiologic Parameters

Measure	*M*	*SD*	Measure	*M*	*SD*
Systolic	125.4231	18.41776	Respirations	16.5385	1.30325
Systolic	129.1538	17.70354	Respirations	16.5769	1.70113
Systolic	121.5769	17.02979	Respirations	16.4231	1.06482
Diastolic	69.0769	9.58717	Temp (F)	98.1308	.63420
Diastolic	68.5385	9.52147	Temp (F)	98.1423	.49653
Diastolic	68.8077	8.31394	Temp (F)	98.5038	.73999
Pulse	88.2308	13.11582			
Pulse	88.2692	15.34811			
Pulse	86.6923	14.59252			

Figure 4.4. Pain Scores Trends Day 3 and 4

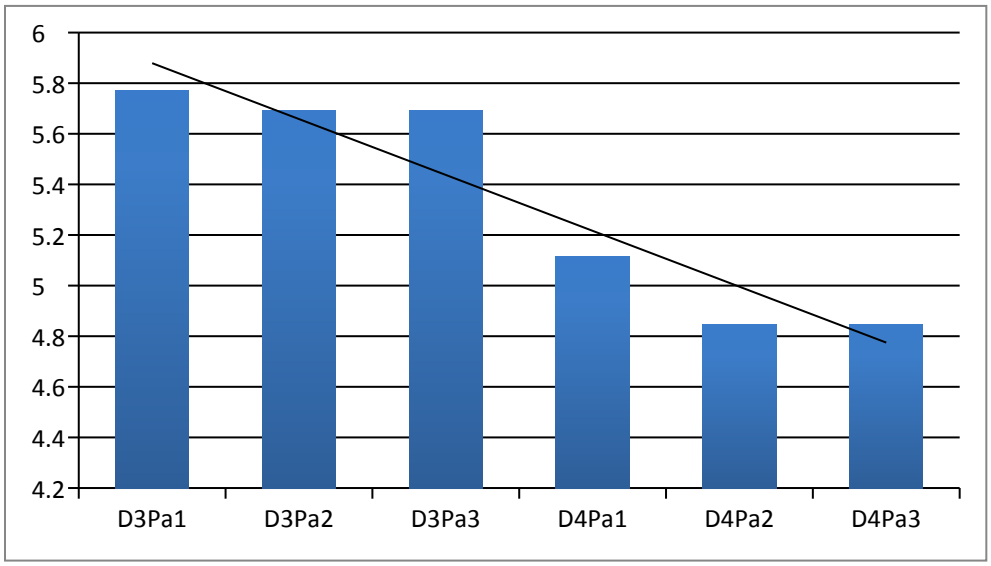


Figure 4.5. Opioid Medication Usage (mg) Day 3 and 4

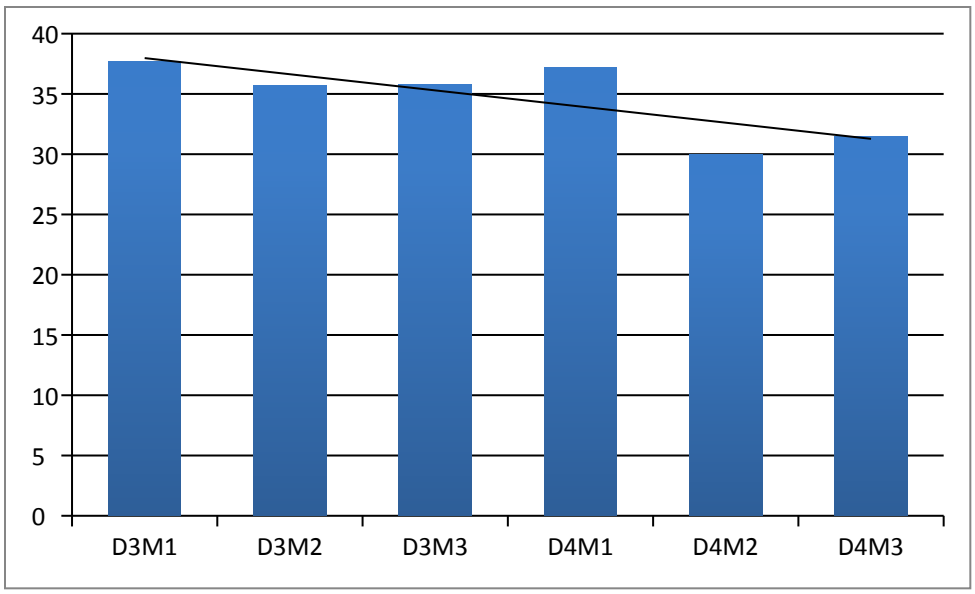


Figure 4.6. Paired-samples *t*-test

Comparison	*t*	*df*	Sig.
D3Pa1 – D4Pa1	2.516	25	.019
D3Pa2 – D4Pa2	2.590	25	.016
D3Pa3 – D4Pa3	2.008	25	.056
D3M1 – D4M1	.103	25	.919
D3M2 – D4M2	.806	25	.428
D3M3 – D4M4	1.135	25	.267

CHAPTER 5

DISCUSSION

The results of this project answered the proposed PICOT question, “Do adult postoperative spinal patients, who use therapeutic music on postoperative day four, report reduced pain scores and require less opioid medication at a small Midwest physician owned hospital?” There were statistically significant decreases in reported pain scores and clinically significant decreases in opioid medication usage from day 3 to day 4. An evaluation will review the utilization of the transpersonal caring theory and EBM model as well as strengths and limitations. Finally, future-nursing implications will be discussed in order to implement the next phase of implementing the protocol into practice.

Explanation of Findings

Primary outcome. Several statically significant differences were found by utilizing a paired t-test when comparing the pre and post implementation of this single group project. There was nearly a decrease of 1 point in pain scores found between day 3 time interval 1 (M = 5.7692) to day 4 time interval 3 (M = 4.8462) but these results were not statically significant when compared ($t(25)$ = 1.935, p > .05). However, there was an overall decrease in pain scores when comparing the same time intervals on each day (see Figure 4.6). These results are consistent with those found in major systematic reviews such as Cole et al. (2014), Hole et al. (2015), and Singh (2015). While Cole et al. (2014) and Hole et al. (2015) found larger decreases in pain scores, different pain tools were utilized in those reviews than used in this EBP project. The majority of their findings were based on a 100mm VAS scale while this project used a 10-point pain scale. The reviews by Cole et al. (2014) and Hole et al. (2015) also focused on the effectiveness of music as a stand-alone variable and scores were recorded directly following the intervention. This EBP project utilized those results to create the protocol and focused on downward trending pain scores from day 3 to day 4.

While the pain scores were statically significant, the opioid medications did not show statistically significant *t*-test scores (see Figure 4.6). However, the Pearson correlations were significant at all three intervals (0700-1500, 1501-2300, 2301-0700) ($r = .857$, $p < .001$; $r = .456$, $p < .05$; $r = .864$, $p < .01$ respectively). These results reveal a negative linear association showing a downward trend in opioid medication usage from day 3 compared to day 4 (see Figure 4.5). Several extraneous variables may have influenced this outcome. Opioid medication is ordered on a PRN basis that is usually every 4 hours. Nursing staff may have been providing medication for clients that may not have needed the medication but wanted to prevent acute pain flare-ups. Another explanation could be the timing of the medication. Some 8-hour increments may have only contained one administration of medications while others had two. This outcome reflects results found in Cole et al. (2014) and Hole et al. (2015).

The inpatient staff did not recommend changes to the protocol based on the ease of adding therapeutic music into their regular practice routine. Music stations were set up, training was provided to retrieve the stations, and clients could take control at any time after the initial session. This project links the transpersonal caring model by creating a deeper relationship between nursing staff and clients. Clients perceived they have control over this therapy to help reduce their pain. While nursing staff viewed this as a nursing intervention they can oversee without a physician order. Therefore staff and clients worked together to complete the maintenance of therapeutic music throughout the hospital stay. The EBM model was also utilized successfully as this change was based on the evidence found in the literature and each step of the model was used to produce the protocol.

Secondary outcomes. The results of physiologic parameters were consistent with the literature. Several of the articles highlighted in the literature review measure physiologic parameters including BP, HR, and RR. Specifically, Lin et al. (2011) provided evidence that HR and RR decreased with therapeutic music but reported mixed results including non-significant decreases in both measures. This EBP project calculated an increase mean pulses ($t(25) = -$

.196, $p > .05$; $t(25) = -1.191$, $p > .05$; $t(25) = -1.134$, $p > .05$) but positive linear significance was calculated ($r = .707$, $p = .000$; $r = ..565$, $p < .003$; $r = .675$, $p = .000$) using the Pearson correlation. An explanation for these differences may be the timing of the intervention. No specific time was given to implement music and vital sign recording did not necessarily correspond directly following to the intervention. Therefore, patient activity may have increased at the time vital signs were recorded causing increased physiologic parameters but did not affect pain levels or opioid medication usage.

Evaluation of Applicability of Theoretical and EBP Frameworks

Theoretical Framework. Jean Watson's theory of transpersonal caring was the framework for this EBP project. Therapeutic music is a CAM therapy that needs to be tailored to patient preference to have success. Participants and nursing staff worked together to complete therapeutic music. The nurse educated and reminded the participants about therapeutic music and timeframes to start and finish. The participants were able to select the music genre, controlled the song selection within the genre, and ultimately managed the timeframe of listening to music. These interactions gave the participant and nurse an opportunity to connect on a deeper due to the personal nature of music preference. This intervention ultimately lead to deeper and more complete participant-nurse relationships as reported by the nursing staff. The organization is also focused on customer service and patient satisfaction. Therapeutic music provided a client specific therapy, which impacts perception of customer service and satisfaction. The weakness of this theory, for this specific project, is the depth of connection between inpatient staff and the participants. While participants and nurses understood they had control over a pain reducing therapy, the nursing staff was not advised to interact on a deeper emotional level with the participant. However, strength of this model is giving the patient some control in deciding their care. Music is a universal experience that most everyone has an opinion of likes and dislikes and people tend to use music to improve their current emotional

state or for personal enjoyment. These types of CAM therapies will improve the nurse and patient relationship when utilized regularly in the inpatient recovery process.

EBP Framework. The EBM model was used as the framework of change in this EBP project. The EBM model has five steps to help bring about evidenced based changes in medical practice. A clinical PICOT question was asked, “Do adult postoperative spinal patients, who use therapeutic music on postoperative day four, report reduced pain scores and require less opioid medication at a small Midwest physician owned hospital?” Evidence was collected from the literature from multiple databases that focused on music reducing pain and opioid used during the surgical recovery process. Specific articles were selected and appraised using the JHNEBP tool to assess the strength of content and findings. The evidence was applied by creating a therapeutic music protocol for an inpatient postoperative recovery unit. The protocol consisted of using music three times during the day for at least 30 minutes on day four of the postoperative period. The evaluation process is started with analyzing the data, which included decrease pain scores and opioid medication usage. To further build on this protocol, the results from this project indicate use of the protocol throughout the perioperative process. Further assessments of nursing compliance and patient satisfaction scores are also recommended to verify the impact of this protocol. Following this protocol, the project was completed without any changes. The protocol was imbedded into the nurse’s daily routine without much interruption in daily tasks; therefore the staff reported little change in their practice. The genres were general enough that participants did not recommend significant changes. Two participants suggested having a spiritual music genre but found selections that they liked from the current genre selection. A weakness of this model was the lack of change in regards to staff or feasibility in practice. Without appropriate staff buy-in, evidence-based changes may be difficult to apply to practice as staff may be hesitant to change. While this model was created for changes in single cases and small clinical settings, this EBP project has determined its effectiveness in larger scale hospital settings.

Strengths and Limitations of the EBP Project

Strengths. This EBP project focused on implementing a new nursing postoperative pain intervention providing staff with self and client directed pain reduction steps that do not require physician orders. Management and nursing staff were eager to implement a protocol that would help reduce pain and opioid medication usage within the facility. Staff nurses were also eager to volunteer help during the implementation process. These management and staff attitudes aided in bringing implementation ownership to staff causing improved compliance leading to good outcomes.

There were several strengths during the implementation process that helped in the ease of implementation into nursing practice, and minimal interaction with the main investigator aided staff compliance by creating ownership with the protocol. Minimal education was needed and staff nurses reported that the written protocol was easy to follow. This EBP project also had minimal impact on the flow of regular operating procedures for staff. The main investigator was focused on trends of reported pain scores and medication usage comparing day 3 and 4. It was found that the lowest pain score was on day 4 time intervals 2 and 3. While the medication usage increased on day 4 time interval 1, overall day 4 time intervals were lower when comparing each time interval to day 3. These results may reflect the ease of completing assessments of pain scores or vital signs during regular nursing practice instead of burdening staff with additional responsibilities.

Another strength of this EBP project was participant familiarity of the intervention. Music is a common experience that the general population uses in regularly in home life. The genre selections were chosen based on the area analysis of music listened in the region. The top 5 genres were selected and nature sounds was added to the list of available music. The Internet genre music stations limited clients to having favorites but did not overwhelm them with too many decisions. Participants were able to find a station of preference and two suggestions

were made to add a spiritual genre of music. However, these participants found music they favored and was satisfied with current music selections.

Limitations. Due to the postoperative procedure of spinal surgeries, clients have intravenous (IV) patient control analgesia (PCA) with diluadid or morphine on day 1 and 2. The PCA diluadid or morphine protocol is continuous and on-demand dosing on day 1. On day 2, the continuous delivery of opioid medication is discontinued, oral medications are introduced, and on-demand dosing continues. The PCA pain medication intervention is discontinued on day 3 and oral medication is continued throughout the rest of the recovery process. Due to the rapid change in IV medications on day 1 and 2, the main investigator delayed implementation until day 3 and 4 to avoid medication changes as extraneous variables. While pain score and opioid medication reduction may be seen in the natural course of the recovery process, the suggestion for implementation during the perioperative process would alleviate these concerns. While the significant pain and opioid medication reductions were calculated, time could not be definitively ruled out as a possible variable.

Another limitation was lack of formal nursing compliance check within the protocol. The main investigator called the inpatient floor weekly to speak to the charge nurse providing reminders and problem solving if needed on day 3 for each participant. These steps, while seemingly effective, may have improved the outcomes with a more formal compliance check such as a check box that therapeutic music was completed during the assessment input into the EMR.

Implications for the Future

Practice. Adequate pain control is important in postoperative treatment of spinal surgeries. This therapeutic music protocol helped to decrease pain scores, which is another step or tool toward helping to provide adequate pain control. Reduced pain scores and opioid medication usage can help improve surgical outcomes as found in the literature. Expanding the protocol to include the entire perioperative process and measure activity level, incentive spirometry

compliance, sleep quality, and overall sedation are other outcomes that can lead to improved surgical outcomes.

As recent guideline changes have been established by the Center for Disease (CDC) and Drug Enforcement Administration (DEA) decreasing the supply of opioid medications, an integrated approach to pain management is becoming a preferred method of treatment. APN's are especially qualified to serve as a change agent in pain management. The holistic approach to care and focus on evidence-based practice, provide adequate leadership to manage the implementation of CAM therapies such as music into the hospital recovery process. CAM therapies such as therapeutic music are part of an integrated model to help reduce that amount of postoperative pain experience, therefore reducing the amount of opioid medication usage. It is important to find effective and easily performed CAM therapies within the inpatient setting as these therapies can affect hospital reimbursement through improved pain control and reduce medication usage to address the change in DEA policy.

One-reason inpatient hospitals lack adoption of therapeutic music within the recovery process may be lack of an inpatient protocol. This EBP project provides the start of a protocol that can easily be implemented in any hospital or inpatient facility. Hospitals can expand or improve this protocol to adequately address their facilities specific abilities and needs. As traditional medication therapy will decrease with the new regulations, health care organizations will be looking for ways to decrease pain to minimize the use of opioids used during hospital admissions.

Another reason for hesitancy for implementation is music administration. The articles reviewed in the literature all used a modified version of disc man, CD player, or MP3 player. With the common use of Internet based applications and Wi-Fi public access, these costs decrease dramatically as it may be part of a service already provided to the client. This EBP project may cause increase usage of therapeutic music in postoperative recovery due to the practical nature of the protocol and minimal effect on nursing and financial strain.

Theory. The results of this project reveal the usage of the theory of transpersonal caring and EBM model. These theories were the foundation that led the main investigator to create and implement a successful change in practice. Understanding the elements of change, APNs have the education and theoretical background to create protocols to implement EBP changes within all practice settings. Utilization of practice change theories aid APNs to help improve success in these practice changes.

Pain has been well defined in terms of type, location, quantity, and quality. Somatic, visceral, and neuropathic are the major types of pain that affect individuals. While the gate control theory has merit in explaining psychological effects within the realm of treatment, music has been shown to alter brain chemistry to release dopamine. CAM therapies, especially those that have psychological impact, have shown that pain is a multimodal disease process. Using these CAM therapies to connect psychological and physical elements will continue to show improved outcomes in pain management. Therefore, integrative practice of pain control is starting to take hold in the pain community. Integrating EBP with nursing theory like the transpersonal caring, and traditional medicine may lead to a break through in improved outcomes in managing pain during the perioperative process.

Research. Therapeutic music has been extensively researched. However, protocols into different practice settings have not been suggested. As a researcher, APNs are continually advancing EBP that is grounded in scientific data of the highest level of research. While JBI (2009) provides a generic guideline based on systematic reviews, adopting this practice into the clinical setting has legged. While the inpatient or outpatient clinic, therapeutic music has not been a mainstay therapy to help reduce pain. Future research needs to focus on how clinicians have provided this therapy into practice by creating protocol for different settings. This EBP project is the foundation for bringing therapeutic music into the inpatient recovery process. The next step is replicating this protocol of music throughout the perioperative process as suggested by the literature. The protocol would be expanded to retrieving client music preferences during

the preoperative process, creating a specific client internet music station, and playing music at least three times per day for at least 30 minutes throughout their hospital experience. Expanding the outcomes of focus to include patient satisfaction and nursing compliance would also be suggested. The literature review indicated that patient satisfaction scores increase with the therapeutic music intervention. Due to the importance of patient satisfaction on reimbursement, showing an improved outcome in patient satisfaction would be another reason to implement this protocol into routine practice. While nursing compliance did not seem to be an issue during this project, compliance was never measured. If there were any compliance issues, there may have been improved outcomes with this project. Nursing compliance is important so the protocol can be as successful as possible.

Education. Traditional pain management has dominated the culture in America for a long time. Largely, clients are used to asking for pain medication regularly throughout the postoperative process and have little interest or desire to attempt CAM therapies. Education is a key role of the APN. They can play a unique and key role in bridging this gap with clients in pain. Education regarding CAM therapies, especially therapeutic music, need to be established at the earliest stages of recovery and pain management. Therapeutic music is effective and can be implemented at any stage, utilized in any setting, and established in a majority of people's lives. These factors give therapeutic music a distinct opportunity to be a central part of the therapeutic process in pain management especially on the inpatient setting. Educating staff about this process and the successful outcomes is important to establish the continuation of this protocol. Therapeutic music is used primarily as a tertiary prevention and should be a mainstay in pain management due to low cost, low potential for adverse effects, and availability to the general population of all genders, races, and socioeconomic classes. This EBP project was used as an educational experience for the participants as most were surprised at the effectiveness during their hospital stay and most stated they would use this CAM therapy at home on a regular basis.

Conclusion

The purpose of this EBP project was to establish and implement a protocol utilizing therapeutic music in the postoperative period of spinal surgeries to reduce the pain experience and decrease opioid use. This protocol was built on the theoretical framework of transpersonal caring, which strives to produce deeper relationships between clients and staff to improve outcomes. The EBM model was used as a guide for change. The steps were followed throughout this project by asking the clinical question, completing an extensive literature search and analysis, implementing a change in practice, and evaluating that change. This EBP project succeeded in producing a protocol that implemented therapeutic music into the postoperative process, which significantly reduced pain and opioid medication use as described in the literature analysis. The findings warrant the need for delivering this service throughout the perioperative process as indicated in the literature. Additional outcome testing should be added to evaluate the full scope of therapeutic music's affect on clients including patient satisfaction and nursing staff compliance.

The results of this EBP project also indicate the need and effectiveness of regular use of CAM therapies during the postoperative process. APNs can lead the way to implement these changes in a field that is dominated by tradition. APNs need to use their roles as an educator, clinician, researcher, consultant, and leader to implement evidence-based practice changes to facilitate the best outcomes possible for their clients. While traditional pain management may work effectively, additional non-traditional therapies should be integrated into the postoperative process for optimal surgical outcomes.

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BIOGRAPHICAL MATERIAL

Mr. Poulsen graduated from Wisconsin Lutheran College with a Baccalaureate degree of psychology in 2004. For 14 years, he worked in various medical roles and settings before advancing his education at Valparaiso University achieving a Baccalaureate degree in the science of nursing in 2014. He currently works as a night charge nurse on a medical and surgical unit at Unity Hospital. He has been teaching undergraduate clinical experiences in medical-surgical, psychiatry, and fundamentals at Valparaiso University for the last two years. Michael is currently enrolled in Valparaiso University to earn a DNP in 2017. Michael is a member of several nursing organizations including Sigma Theta Tau International (STTI), Wisconsin Evangelical Lutheran Nursing Association (WELSNA), American Association of Nurse Practitioners (AANP), American Nursing Association (ANA), and Indiana State Nursing Association (ISNA). He is interested in using alternative therapies to help reduce pain and psychological distress following his experience working in a multidisciplinary pain clinic. His interest in alternative therapies led to his DNP project writing a protocol for using therapeutic music to help reduce postoperative pain on a inpatient hospital unit. In December 2016, Michael published his first nursing article entitled “Alleviating Stress with Music” in the ISNA featured magazine *Nursing Focus Magazine*.

ACRONYM LIST

AHRQ: Agency for Healthcare Research and Quality

APA: American Psychological Association

APN: Advanced Practice Nurse

BP: Blood pressure

CAM: Complimentary and adjuvant medicine

CDC: Center for Disease Control

CMS: Center for Medicare and Medicaid Services

DEA: Drug Enforcement Administration

EBM: Evidence based medicine

EBP: Evidence-based practice

EMR: Electronic medical records

HR: Heart rate

ICU: Intensive care unit

IOM: Institute of Medicine

IV: intravenous

IRB: Institutional Review Board

JHNEBP: John Hopkins Evidence-Based Practice

M: Mean

NIH: National Institute of Health

PAE: Patient assisted epidural

PCA: Postoperative controlled analgesia

PRN: As needed

PT: Patient teaching

PTRM: Patient teaching and relaxation and music

RCT: Randomized controlled trials

RM: Relaxation and music

RR: Respirations

SD: Standard deviation

SPSS: Statistical Package for the Social Sciences

THA: Total hip arthroplasty

TKA: Total knee arthroplasty

VAS: Visual analog scale