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Jonathan Garcia
garcia9@otterbein.edu

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Jonathan C. Garcia BSN, RN, CCRN

Department of Nursing, Otterbein University

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DNP Final Scholarly Project Team:

Brian Garrett, DNP, CRNA, Team Leader

Kacy Ballard, DNP, CRNA, Team Member

Amy Bishop, DNP, AGCNS-BC, Team Member

Approved by: Brian Garrett, CRNA

Author Note

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Correspondence concerning this article should be addressed to Dr. Brian Garrett, 1 South Grove Street, Westerville, OH 43081. bgarrett@otterbein.edu

Abstract

Primigravida women undergoing cesarean section under neuraxial anesthesia frequently suffer from anxiety in the perioperative period. Literature suggests this population suffers disproportionately due to gender, surgical naiveness, lack of birthing experience, fear of complications, and exposure to the operating theatre's noxious environment. Despite the high anxiety prevalence and numerous negative consequences, safe treatment options are lacking. Unfortunately, contemporary pharmacologic therapy to treat anxiety threatens the parturient and the fetus. However, the field of medicine has long appreciated music's physiologically calming effects on the body. This project details a literature search, review, synthesis, and analysis of the available literature supporting and guiding the use of music intervention in the defined population. With the Iowa Model, this final scholarly project develops evidence-based practice guidelines for using music as a form of anxiolysis in the perioperative period. The secondary goals for the project were to create a comprehensive implementation, monitoring, and adjustment plan if the project outcomes were not as expected. The project was developed for the proposed implementation at a high throughput obstetric and gynecological unit within a large, inner-city, comprehensive teaching hospital in Southwest Ohio with a Level 1 Trauma Center designation. By implementing music intervention in the perioperative period for primigravida women undergoing cesarean section under neuraxial anesthesia, women can enjoy decreased levels of anxiety, decreased incidence of tachycardia, and other improved surgical and anesthesia outcomes.

Keywords: Music, cesarean section, primigravida, anxiety, anxiolysis

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Introduction

Giving birth is one of life's most memorable and meaningful moments. However, many women's birthing experiences are negatively affected by feelings of stress and anxiety. The prevalence of perioperative anxiety in the obstetric population is extraordinarily high, with some sources speculating it could be close to 70% (Fentie et al., 2022). Research shows pregnancy and childbirth are incredibly stressful for primigravida women. These women are emotionally processing many unknowns and the experience of delivering via cesarean compounds the anxiety experienced by the mothers. Women's awareness during surgery is often also a contributing factor to their anxiety. During cesarean delivery, women are most often aware since the standard anesthetic approach for cesarean section is neuraxial anesthesia.

Not only are birthing experiences negatively affected when the mothers are anxious, but the women and the unborn infants stand to suffer potentially catastrophic consequences when stress levels go unnoticed and unchecked. Increased risk for intraoperative hemodynamic derangement (Fentie et al., 2022), infection (Ji et al., 2022), and hemorrhage (Zhou and Li, 2011) are among the possible consequences. Unfortunately, contemporary pharmacologic methods for anxiolysis threaten the parturient and the fetus.

However, holistic medicine has long recognized music for its calming physiological effects on the human body. Due to this effect, the focus of this final scholarly project details, through the Iowa Model, music is a practical, affordable, easily implementable, non-pharmacologic intervention that can improve the birthing experiences and outcomes of first-time mothers giving birth via cesarean section. While music is readily available and backed by a

plethora of data, few institutions utilize it as an intervention for this particularly vulnerable population. The project encompasses the background of perioperative anxiety in primigravida women, a literature search, review, and analysis that supports the use of music as a form of anxiolysis for primigravida women undergoing cesarean section, and a complete plan describing the implementation of music for the population in a busy obstetric unit at a Level 1 Trauma Center in southwest Ohio. By exploring the implementation of music for anxiolysis in primigravida mothers undergoing cesarean section, this final scholarly project aims to decrease maternal anxiety, and incidence of tachycardia and build upon the growing body of knowledge to improve the quality of care for this unique subset of the obstetric population.

Background

Primigravida women preparing to undergo surgical delivery frequently suffer from perioperative anxiety. Cesarean section, often called c-section, is the surgical procedure in which an obstetrician delivers the unborn fetus through an incision in the abdomen. Cesarean sections may be planned or emergent, under neuraxial or general anesthesia, and are becoming more prevalent (Centers for Disease Control and Prevention, 2023). According to the Centers for Disease Control and Prevention (2023), 32.1% of all deliveries in the United States (1,174,545) were born via cesarean section. The World Health Organization (2021) predicts that cesarean delivery rates will continue to rise and, by 2030, may exceed 50% in many developed countries. The driving factors for the rise in cesarean rates vary between and within countries. The World Health Organization (2021) suggests that health sector policies and financing, cultural norms, perceptions and practices, preterm birth rates, and healthcare quality fluctuations may be influential. However, some data suggest that prenatal anxiety may be a contributing factor (Zhou and Li, 2011).

As more women deliver via cesarean section worldwide, the incidence of associated conditions will also likely increase. Anxiety is one of the well-known conditions related to cesarean delivery. Anxiety is likely associated with cesarean section because the delivery experience is unknown for many women, especially primigravida (Abargohee et al., 2022).

Prevalence

Perioperative anxiety is common among the general surgical population. In a comprehensive review of the non-pharmacologic treatment of preoperative anxiety, Wang et al. (2022) found that preoperative anxiety prevalence ranges from 11% to 80% among the general adult population. However, Khalili et al. (2019) found that being young and female were strong predictive factors for high state and trait anxiety.

Being female and young is strongly predictive of high state and trait anxiety, so it's no surprise that perioperative anxiety is most elevated in obstetrics (Abate et al., 2020). Ferede et al. (2022) also report that obstetrical patients tend to have disproportionately higher levels of preoperative anxiety compared to other surgical populations. In their study, Ferede et al. (2022) found that the most common fears of women undergoing cesarean section are complications and death from the operation. Moreover, Fentie et al. (2022) list the prevalence of anxiety for women undergoing elective cesarean section as high at 67.9% and state that primiparous women with no surgical or anesthetic history are at an even higher risk for anxiety. Thus, first-time mothers undergoing elective cesarean section are particularly vulnerable to developing anxiety and its associated sequelae. Additionally, women undergoing cesarean section are most often awake and aware of their surroundings due to neuraxial being the anesthetic of choice and, therefore, suffer exposure to the noxious stimuli of the operating room (OR) environment, which may play a role in triggering the stress response.

Consequences of Anxiety

Anxiety is not just an unpleasant subjective sensation for the surgical patient. Patients who experience anxiety also encounter increased tangible risks for adverse anesthesia and surgical outcomes and complications. Ji et al. (2022) reviewed the effect of preoperative anxiety on operative outcomes which found that anxiety was positively associated with increased pain, impaired wound healing, increased risk for infection, decreased satisfaction, arrhythmia, increased length of stay, decreased ability to return to daily activities, increased anesthetic requirement, cardiac events, and even death. For this project, tachycardia as a hemodynamic derangement consequence of anxiety is a primary focus.

Additionally, mothers may have difficulty with lactation and initiating breastfeeding if stress levels go unchecked (Halder et al., 2022; Hepp et al., 2018; Weingarten et al., 2021). Possible psychological impacts of maternal anxiety include impaired psychological development and anxiety in the child, post-partum depression, and negative feelings regarding childbirth in the mother (Hepp et al., 2018; Weingarten et al., 2021; Abarghoee et al., 2022; Kaur et al., 2023). A study by Alipour et al. (2012) echoes findings of increased risk for post-partum depression. The authors report that anxiety in the third trimester is an independent risk factor for developing post-partum depression (Alipour et al., 2012). The authors state that women who experience anxiety are 3.4 times more likely to have post-partum depression. Furthermore, Zhou and Li (2011) found a correlation between women with prenatal anxiety and non-indicated cesarean and intrapartum hemorrhage during surgical delivery.

Researchers have also established a correlation between preoperative anxiety and postoperative pain (Ghanei et al., 2013). Consequentially, anxious patients are likely to consume more opioids, predisposing them to nausea and vomiting, sedation, fatigue, ileus, constipation,

and addiction (Bollag et al., 2021). Anxiety in the preoperative period can additionally lead patients planning to deliver via cesarean to refuse preferred practice techniques such as regional anesthesia, placing them at increased risks appreciated with delivery under general anesthesia (Maheshwari & Ismail, 2015).

The risks associated with unnecessary general anesthesia for cesarean delivery are surgical site infections, venous thromboembolic events, and rare but life-threatening and costly anesthesia-related complications such as aspiration (Ring et al., 2021). Warner et al. (2021) echo findings of increased risk of aspiration in a review of the gastric aspiration claims in the Anesthesia Closed Claims Project. The authors report that patients undergoing general anesthetic surgery accounted for 80% of the aspiration events, while only 3% occurred during regional techniques.

Hemodynamics

Hemodynamic derangement is among the physiologic consequences of mental stress in the perioperative period. Horasanli and Demirbas (2022) and Kaur et al. (2023) report that hemodynamic derangements from anxiety are common and attributable to sympathetic nervous system stimulation and the resultant increased release of catecholamines. Ji et al. (2022) also report a positive correlation between perioperative anxiety and unfavorable hemodynamics. Tadesse et al. (2022) echo findings of hemodynamic derangement and specifically note an increase in mean arterial pressure, systolic blood pressure, and heart rate, sometimes persisting up to 30 minutes after the induction of general anesthesia with perioperative anxiety. Additionally, Fentie et al. (2022) link anxiety to increased myocardial infarction rates, risk of heart failure, pulmonary edema, and mortality.

Hemodynamic consequences aren't sequestered to only the mother. Since the maternal and fetal circulations are physiologically linked, the fetus suffers hemodynamic effects from maternal anxiety. Fetal hemodynamic consequences include abnormal fetal heart rate patterns, low Apgar scores, and potential asphyxiation and mortality (Abarghoee et al., 2022). Similarly, Jorge and Nomura (2023) report ultrasonographic evidence that umbilical vein blood flow was significantly lower (189.4 vs. 249.5 mL/min; $p=0.047$) in mothers who suffered moderate to severe levels of anxiety when compared to mothers who faced minimal or mild anxiety. The decreased umbilical vein blood flow in anxious mothers decreases oxygen delivery to the fetus, explaining the potential asphyxiation and associated mortality experienced by fetuses carried by anxious mothers.

Benefits of Anxiolysis

Besides avoiding complications from lack of treatment, there are benefits to anxiolysis. In a study of 146 parturients, Fu et al. (2012) found that reduced preoperative anxiety in mothers undergoing cesarean section effectively promoted early lactation, superior postoperative analgesia, and shorter indwelling urinary catheter times. Any reduction in catheter time likely reduces the risks of catheter-associated urinary tract infections (CAUTIs) and associated costs (Letica-Kriegel et al., 2019).

Pharmacologic Treatment and Associated Hazards

To reduce anxiety and the associated adverse outcomes, anesthesia providers regularly administer pharmacologic treatments. Drugs commonly used as adjuncts for anxiolysis include dexmedetomidine, midazolam, ketamine, propofol, nitrous oxide, and fentanyl. However, administering pharmacologic anxiolysis to a pregnant mother undergoing cesarean section poses unique risks to the patient and the fetus.

Hazards of pharmacologic anxiolysis in the delivering parturient include possible oversedation, respiratory depression, and impaired maternal recall of the birthing experience (Danielak-Nowak et al., 2016). Danielak-Nowak et al. (2016) found that excessive sedation occurred in 34.5% of patients who received midazolam and 11.5% of patients who received propofol during spinal anesthesia for cesarean section. Maternal sedation can also inhibit the mother's ability to perform self-care and care for a newborn directly following the procedure, which may delay maternal-fetal bonding. Placental transfer of drugs to the fetus and fetal respiratory depression are also concerns when providing drugs to mothers who have not yet delivered (Erol & Aytac, 2018). The risks associated with administering pharmacological anxiolysis (Danielak-Nowak et al., 2016), the disproportionately high prevalence of preoperative anxiety in those delivering via cesarean section (Ferede et al., 2022), and the risks associated with leaving preoperative anxiety untreated (Ji et al., 2022; Tadesse et al., 2022) necessitate the investigation of non-pharmacologic modalities for relieving perioperative anxiety in the gravid woman.

Significance to Nurse Anesthesia

Unfortunately, despite such high occurrence and well-known sequelae of anxiety in the perioperative period, certified registered nurse anesthetists (CRNAs) and anesthesiologists frequently undertreat anxiety in the parturient due to justified concerns of placental transfer of drugs and resultant fetal depression. As a result, anesthetists spend significant time attempting to reassure patients during moments of stress. When necessary, reassurance is essential to establishing a positive nurse-patient rapport and patient-centered care; however, spending copious amounts of time bolstering a patient's mental state may distract and delay the provider from recognizing and treating pertinent medical issues such as developing hemorrhage,

hemodynamic derangement, or desaturation. If providers could apply an effective, cheap, non-invasive, effortlessly implementable, and safe non-pharmacologic intervention for anxiolysis like music, the nurse-patient relationship could be maintained while increasing providers' time and attention to managing other more pressing medical issues. Anxious women are also more likely to undergo general anesthesia for delivery, experience complications, and seek litigation against the anesthetist. Therefore, finding a non-pharmacologic intervention for anxiety in gravid women is significant to the profession of nurse anesthesia.

PICOT Question

Melnyk and Fineout-Overholt (2018) suggest forming a question in population, intervention, comparison, outcome, and time (PICOT) format to focus the evidence-based literature search and efficiently find data relevant to the clinical concern. Using the suggested PICOT format, an appropriate guiding question for the clinical problem above follows: In primigravida mothers undergoing non-emergent cesarean section under neuraxial anesthesia (P), would the development and implementation of evidence-based practice (EBP) guidelines for utilizing preselected classical music (I), compared to traditional management (C), affect anxiety levels and heart rate (O) intraoperatively (T)?

Literature Search

Otterbein OneSearch and PubMed were employed to conduct the literature search. OneSearch is a search engine that simultaneously combs multiple databases for books, articles, and other media relevant to the search terms. OneSearch explores 304 resources such as EBSCO, CINAHL, and others (Otterbein Courtright Memorial Library, n.d.). PubMed is an online resource with over 35 million citations from MEDLINE, life science journals, and online books (United States Department of Health and Human Services, n.d.).

The initial search was performed in OneSearch using the following search terms and Boolean operators: Music therapy OR music intervention OR musical therapy OR musical intervention OR music-based intervention OR therapeutic music OR music treatment OR music AND cesarean section OR caesarean section OR c-section OR cesarean delivery AND anxiety OR fear. The search had the following limiters: Full text, peer-reviewed, published within the last five years, and in English. The search retrieved 32 results. Each of the article titles was then assessed for relevance. A study was deemed irrelevant if, in the title, the patient population, intervention, or measured outcomes were explicitly stated and contradicted the PICOT question. If found to be potentially relevant after rapid appraisal of the title, the abstract was appraised using the same criteria. After systematic review, 13 articles were found suitable and were included.

A second search was performed using PubMed. The search terms and Boolean operators used were the following: Music therapy OR music intervention OR musical therapy OR musical intervention OR music-based intervention OR therapeutic music OR music treatment OR music AND cesarean section OR caesarean section OR c-section OR cesarean delivery AND anxiety OR fear. The search had the following limiters: Full text, peer-reviewed, published within the last five years, and in English. The search returned 11 results. The 11 results were then appraised for relevance using the same criteria above. Five of the results were determined to be relevant; however, four were duplicates returned by OneSearch. One suitable abstract was selected for inclusion.

Literature Review and Synthesis

Measuring Anxiety

Anxiety is subjective to the person experiencing it, making it difficult for researchers and medical professionals to measure the phenomena and its relationship to implemented interventions aimed at providing relief. However, several instruments and measures exist that attempt to gauge patients' severity of anxiety. The State-Trait Anxiety Inventory (STAI), Visual Analog Scale (VAS), Hamilton Rating Scale (HARS), Amsterdam Preoperative Anxiety and Information Scale (APAIS), and Zung Self-Rating Anxiety Score are examples of the various instruments and scales implemented within the studies identified through the literature search. The most commonly employed tool for measuring experiment participants' anxiety in the identified literature was the STAI (Abarghoee et al., 2022; Hepp et al., 2018; Horasanli & Demirbas, 2022; Parodi et al., 2021; Toker et al., 2021; Weingarten et al., 2021).

The STAI is reliable, valid, and consists of 40 questions rated on a 4-point Likert scale with answers ranging from 1- not at all/almost never to 4- very much so/almost always; 20 of the questions measure a person's predisposition for being anxious (Trait anxiety), and the other 20 measure the person's situational anxiety level (State anxiety). Most studies focused on the music's relationship to scores on the state portion of the STAI to gauge effectiveness. A copy of the state portion of the STAI is included in Appendix A. None of the studies expounded on what participants had to score to be considered anxious versus relaxed. However, higher scores correlate with higher levels of anxiety. Additionally, questions 1, 2, 5, 8, 11, 15, 16, 19, and 20 are reverse coded for scoring purposes. Internal consistent coefficient and test-retest reliability coefficients over two months range between 0.86 and 0.95 and 0.65 and 0.75, respectively (Spielberger et al., 1983). Abargoee et al. (2022) report a Cronbach's Alpha of 0.90 and a test-

retest reliability of 0.62. Given the expected fluctuations in patients' state anxiety depending on situational factors, lower than desired test-retest reliability is expected.

In the literature, researchers also commonly used direct measurements of hemodynamics or vital signs such as respiratory rate, heart rate, oxygen saturation, and blood pressure as surrogates of participants' stress levels (Halder et al., 2022; Handan et al., 2018; Hepp et al., 2018; Horasanli & Demirbas, 2022; Kaur et al., 2023; Khaity et al., 2022; Weingarten et al., 2021; Wong et al., 2021). Another novel method of measuring stress identified in the literature was the direct cortisol measurement in the serum (Kaur et al., 2023) and saliva (Hepp et al., 2018). Pain measurement, patient satisfaction, and opioid requirement as secondary outcomes were common themes identified in the literature (Dryzmalski et al., 2020; Halder et al., 2022; Hepp et al., 2018; Khaity et al., 2022; Kurdi & Gasti, 2018; Toker et al., 2021; Weingarten et al., 2021). STAI scores and maternal heart rates will be the units of measurement for maternal anxiety within this final scholarly project.

Effects of Music on Anxiety

Of the studies reviewed, 13 examined the relationship between participants' anxiety and music during the perioperative period via an instrument assessing self-reported anxiety. Two of the studies are large recent meta-analyses and systematic reviews, ten are randomized controlled trials (RCTs), one is double-blinded, and one is a pre-experimental one-group pre and post-test analysis.

Khaity et al. (2022) are a large meta-analysis of 13 RCTs involving 1,513 patients, concluding that music is associated with a decrease in overall anxiety scores (standardized mean difference, -0.26; 95% confidence interval, -0.39 to -0.14; $p < 0.0001$). Another sizeable systematic review and meta-analysis of 15 RCTs containing 1,361 patients by Weingarten et al.

(2021) reached similar conclusions. The authors report that music decreases intraoperative anxiety; however, for pre-and postoperative anxiety, the effect music had on participants' anxiety levels varied depending on the instrument utilized by the study.

Of the RCTs, four examined participants' preprocedural anxiety levels. Each of these studies concluded that music has a statistically significant effect of anxiolysis before undergoing a cesarean section (Abarghoee et al., 2022; Dryzmalski et al., 2020; Parodi et al., 2021; Wong et al., 2021). One RCT focused on the intraoperative period and determined that music is effective as a form of anxiolysis during the procedure (Hepp et al., 2018).

Researchers also studied music as anxiolysis during the postoperative period and found music to be effective (Horasanli & Demirbas, 2022; Kaur et al., 2023; Kurdi & Gasti, 2018; Toker et al., 2021). Dryzmalski et al. (2020) were an outlier regarding postoperative effectiveness. Despite seeing clear correlations during the other preoperative period, Dryzmalski et al. (2020) could not associate music with decreased postoperative anxiety.

Interestingly, one RCT examined the effects of music during the pre-and intraoperative periods and found the intervention to be effective during both (Handan et al., 2018). The pre-experimental one-group pre and post-test analysis found that all 30 participants experienced reduced anxiety following exposure to music therapy, but implementation details are lacking (Marwang et al., 2020).

The proposed mechanism by which music inhibits or reduces anxiety is through the attenuation of excitatory neurotransmitters in the hypothalamus, reticular activating system, and hippocampus through auditory pathways and the limbic system (Halder et al., 2022). Parasympathetic nervous system activation, reduced sympathetic nervous system activity, and attention distraction are also factors thought to have beneficial effects (Halder et al., 2022).

Effects of Music on Heart Rate

Patients' hemodynamics are of particular concern to the anesthesia provider. It is well known that tachycardia and sympathetic stimulation increase oxygen consumption (Tune et al., 2004). With cardiac disease being the most significant single cause of indirect deaths of parturients, increased oxygen consumption from tachycardia is particularly problematic (Coad & Frise, 2021). In the identified literature, eight studies included hemodynamic measurements as variables of interest. Two studies examining hemodynamics were meta-analyses and systematic reviews, and six were RCTs.

The two meta-analyses and systematic reviews identified in the literature came to different conclusions regarding the impact of music on parturient heart rate. Khaity et al. (2022) is the larger and more recent meta-analysis. The authors deduce that music reduces heart rate in the intraoperative period for women undergoing cesarean section. Unfortunately, statistical information from Khaity et al. (2022) is unavailable. In contrast, Weingarten et al. (2021) infer that music does not significantly impact hemodynamic parameters, including heart rate. Of the RCTs, two determined that music does not impact hemodynamics (Kaur et al., 2023; Wong et al., 2021). However, four of the RCTs collected evidence suggesting that music reduces heart rate in the postoperative period following cesarean delivery (Halder et al., 2022; Handan et al., 2018; Hepp et al., 2018; Kurdi & Gasti, 2018).

Most evidence suggests that music positively impacts heart rates in women undergoing cesarean section, especially in the intraoperative and postoperative periods. For example, Handen et al. (2018) report that women exposed to music had lower postoperative heart rates when compared to preoperative heart rates, while the control group's postoperative heart rates were higher when compared to their preoperative heart rates. Halder et al. (2022) report similar

findings. In the post-anesthesia care unit (PACU), the music group had heart rates approximately seven, eight, and four beats per minute slower than their control counterparts postoperatively at 30, 45, and 60 minutes, respectively (Halder et al., 2022). Hepp et al. (2018) found that parturients exposed to music had heart rates approximately seven beats per minute slower at skin incision than parturients who did not listen to music (99.40 vs. 92.57 beats/minute; $p = 0.049$). None of the studies identified in the literature search found that music negatively affects heart rate in the parturient.

Risks of Employing Music for Anxiolysis

When implementing an intervention into clinical practice, one of the most critical points to consider is the possibility of side effects and risks. In the identified literature, there are no identified risks of implementing music for anxiolysis in the parturient undergoing cesarean section. In the identified literature, eight of the studies specifically report that there are no risks in implementing the intervention and that using music for anxiolysis is additionally cost-effective (Abarghoee et al., 2022; Halder et al., 2022; Handan et al., 2018; Hepp et al., 2018; Horasanli & Demirbas, 2022; Kaur et al., 2023; Toker et al., 2021; Weingarten et al., 2021). The remaining six studies do not specifically report no risks or side effects; however, they do not make mention of any observed side effects or potential hazards in their research. Furthermore, many of the studies tout that music is easily implemented and that training the necessary staff requires very minimal time (Abarghoee et al., 2022; Halder et al., 2022; Handan et al., 2018; Hepp et al., 2018; Horasanli & Demirbas, 2022; Kaur et al., 2023; Kurdi & Gasti, 2018; Parodi et al., 2021; Toker et al., 2021; Weingarten et al., 2021)

Types of Music

Researchers implemented various kinds of music to understand whether music choice impacted the effects on maternal anxiety. An identified recurring theme was that preselected slow-tempo, meditation, and classical music were effective in providing relief from psychological stress (Abarghoee et al., 2022; Dryzmalski et al., 2020; Hepp et al., 2018; Horasanli & Demirbas, 2022; Kaur et al., 2023; Kurdi & Gasti, 2018; Marwang et al., 2020; Toker et al., 2021). Other types of music were also found to be effective in reducing anxiety. Parodi et al. (2021) is a unique study examining the effects of novel binaural beat music. The authors concluded that while both types of music significantly reduced anxiety, a specific type of binaural beat delivery system called dynamic multispectrum phase shift (DMSPS) was more effective than identical music without DMSPS applied. Instrumental jazz music was also associated with anxiety reduction but not a favorable hemodynamic profile change (Wong et al., 2021).

The meta-analyses and systematic review by Weingarten et al. (2021) concluded that music was efficacious regardless of whether the researchers or patients chose the genre. Handan et al. (2018) allowed patients to compile a list of their favorite songs with positive results. Halder et al. (2022) permitted patients to choose the music listened to but asked them to listen to classical music if there were no preferences. Halder et al. (2022) also had positive results regarding anxiety levels.

While some research suggests that the choice of music has no bearing on the effectiveness of anxiolysis, some literature is contradictory. For example, the RCT completed by Dryzmalski et al. (2020) found that preselected Mozart significantly reduced participants' pre-procedural anxiety and postoperative pain, but patient-selected music failed to produce

statistically significant results for any of the studied outcomes. Horasanli and Demirbas (2022) echo these sentiments and claim that various types of music have distinctive physiological effects. The authors argue that slow-tempo music is generally associated with decreased hemodynamic parameters, pain, and stress, while higher-tempo music is stimulating and can have the opposite effect. For this final scholarly project, and based upon clinical research, classical music will be the genre utilized for anxiolysis.

Project Objectives

Project objectives are essential for the success of the project. Objectives are the initial step in formulating an operational plan and are measurable actions that lead and guide the project to achieving overarching goals (Moran et al., 2019). The project's goal is to bridge the practice gap in the treatment of preoperative anxiety for women undergoing cesarean section. By decreasing perioperative anxiety, nurse anesthesia providers can reduce pain perception and analgesia requirements, improve wound healing, promote maternal psychological health, and improve success with initiating breastfeeding (Abarghoee et al., 2022; Halder et al., 2022; Hepp et al., 2018; Kaur et al., 2023; Weingarten et al., 2021). The objectives that will guide the final scholarly project to achieve the overarching goal are as follows:

1. Develop EBP guidelines for using preselected classical music intervention as a non-pharmacologic anxiolytic for primigravida mothers undergoing non-emergent cesarean section under neuraxial anesthesia.
2. Develop a comprehensive plan to implement the guidelines related to the use of preselected classical music intervention for anxiolysis.
3. Develop a comprehensive plan to monitor the outcomes pertaining to preoperative anxiety.

4. Develop a comprehensive plan to adjust the guidelines if the outcomes related to preoperative anxiety are less than desirable.

Moran et al. (2019) categorize objectives by level. Objective levels III-VI are considered high-level and focus on application, analysis, evaluation, and creation (Moran et al., 2019). Each objective within this project is considered a high-level objective.

Objective one creates the guideline for using EBP non-pharmacologic intervention to address the practice gap in treating preoperative anxiety in the specific population. Objective two then focuses on applying the procedures developed in objective one. After employing the intervention, the project team must appraise the efficacy of the intervention by examining and analyzing the outcomes data. Examination and analysis are addressed in objective three.

Objective four develops a plan to amend the guidelines in objective one if the team finds it appropriate following analysis of the outcomes data. Suppose the project team determines the intervention to be detrimental or not efficacious even after the initial evidence-based guidelines are amended. In that case, the team will abandon the intervention as is customary in EBP changes (Melnyk & Fineout-Overholt, 2018).

Project Evidence-Based Practice Model

Utilizing a model in the final scholarly project provides structure and guidance to the project. The Iowa Model, initially developed by Marita Titler and used at the University of Iowa Hospitals and Clinics (UIHC) in the 1990s, is an EBP model designed to provide a conduit between research and clinical practice and a systematic approach for integration. The model was born out of a desire to ensure that healthcare decisions are rooted in the highest quality of evidence available to clinicians, to enhance the professional practice environment, and to contain ever-growing healthcare costs (Titler et al., 1994).

The authors have modified the model several times to pivot with the fluctuating healthcare landscape and to positively influence patient outcomes to arrive at the current version (Appendix B) (Cullen et al., 2018). The current version consists of seven critical stages and three decision points between steps two and three, four and five, and five and six. The decision points serve as a feedback loop. Answering no to any of the above questions should prompt the EBP team to question further work on the project, limiting unnecessary and unwarranted expenditures.

Due to the wide recognition by the healthcare community for its ease of use across interdisciplinary teams and its applicability, clinicians have used the Iowa Model to address significant clinical problems before regulatory mandates or updates to reimbursement schedules (Melnyk & Fineout-Overholt, 2018). Given its proven track record and pragmatic approach to dealing with healthcare shortcomings, The Iowa Model is a suitable model to guide the implementation of music for anxiolysis in the primiparous mother undergoing non-emergent cesarean delivery under neuraxial anesthesia. See Appendix C for permission from the developers.

Step 1: Identify Triggering Issues

The first step for process improvement in the Iowa Model is to identify a practice gap. One of the ways clinicians commonly identify practice gaps is by communicating with patients regarding experiences. Cullen et al. (2018) suggest clinicians stay focused on the needs of patients, cultivate a culture of continuous improvement, and partner with patients and families to enhance the patient-centered experience. Women often experience anxiety before, during, and after cesarean delivery, but safe and effective pharmacologic treatment remains a challenge due to the presence of the fetus. The practice gap identified in this scholarly project is the high

incidence of anxiety among women undergoing cesarean section, the lack of treatment options available, and the subsequent sequalae.

Step 2: State the Question or Purpose

A uniform method for formulating clinical inquiries is crucial in EBP (Cullen et al., 2018). The Iowa model suggests developing a clinical question in PICOT format. The PICOT format helps to develop the project's purpose, guides the search for evidence, and sets boundaries for the project so that the team's efforts can remain focused (Cullen et al., 2018). The project aimed to identify an existing practice gap, develop evidence-based guidelines designed to remedy the gap, monitor the outcomes following the implementation of the guidelines, and prepare a plan for addressing unexpected results.

Decision Point 1 - Is This a Priority?

Decision point one in the Iowa model mandates the team to decide if the identified problem in Step One is an organizational priority. Significant leadership support, organizational alignment with the issue, resource availability, project feasibility, and sufficient data to answer clinical questions regarding the topic are indicators that moving forward with the project is appropriate (Cullen et al., 2018). If none of the criteria to move forward with the project are met, the team should consider a different topic. A large amount of data related to the subject is available, minimal resources will be required, implementation of the project is feasible, and network priorities align with the project's goals. Therefore, it is reasonable to proceed.

Step 3: Form a Team

Forming a team with all appropriate members is paramount in implementing EBP. Assembling a team that is too large may impact the manageability of the group, while creating a team that is too small or that fails to include essential members may have issues with forward

progress (Cullen et al., 2018). By understanding the full scope of the project, leaders can involve all necessary disciplines and limit obstacles to completing the project. Common obstacles to project completion are lack of expertise, funding, personnel, and approval. Additionally, identifying, including, and collaborating with key stakeholders can help the team secure additional resources and promote success (Cullen et al., 2018).

The project team will consist of hospital administrators and senior members from the following departments: anesthesia, surgery, obstetrics and gynecology, information technology (IT), informatics and quality improvement (QI), and nursing. To garner approval for the project, Cullen et al. (2018) suggest that the project team prepare a formal proposal that includes EBP findings, recommendations, and an action plan for the necessary parties. The parties responsible for authorizing the project's initiation are hospital administrators, the chief anesthesiologist, the chief CRNA, and the chief of obstetrics and gynecology. Hospital administrators must be involved early to ensure resource availability and allocation. The primary resource necessary for the project is funding. The proposed budget for the project is discussed in step six. Other essential project team members are CRNAs, anesthesiologists, obstetric nurses, IT personnel, and nurse informaticians. Each member's role within the project is discussed in step five of the project.

Step 4: Assemble, Appraise, and Synthesize the Body of Evidence

In the fourth step of the Iowa model, the EBP team searches for, compiles, appraises, and synthesizes data from existing literature to answer whether sufficient evidence exists to drive a practice change. A literature review table is available in Appendix D. Being organized and systematic throughout the search process helps the EBP team efficiently obtain relevant data (Cullen et al., 2018). Using the PICOT question formed in step two of the model to guide the

literature search helps to achieve efficiency, focus, and clarity. A full description of the literature search, review, and analysis is available above.

Decision Point 2: Is there Sufficient Evidence

The next step in the Iowa model instructs the EBP team to decide whether sufficient evidence exists to pilot a clinical practice change. Cullen et al. (2018) argue that applying research findings is not always straightforward and that no precise formula exists for making the correct decision to implement or not implement an intervention. Instead, the team must rely on understanding the EBP and consider the strength of the data, the risks and benefits, the clinical need and setting, and expert clinical judgment (Cullen et al., 2018). Indicators that sufficient evidence exists are repeated themes within the identified literature, repetition of citations and conclusions among references, at least one relevant clinical practice guideline is available, there is sufficient research to organize the articles by study design, and there are many articles of high-quality study design such as RCTs (Cullen et al., 2018).

While no clinical practice guideline exists for using music for anxiolysis or decreasing heart rate, all the identified literature suggests that music is efficacious in the perioperative period. All studies came to the same conclusion: Music effectively reduces anxiety in women undergoing cesarean section. These findings, therefore, suggest that sufficient evidence exists to encourage piloting a clinical practice change.

Regarding implementing music to decrease maternal heart rate, there is conflicting data. However, the most recent and largest meta-analysis and most RCTs examining the relationship between music exposure and heart rate suggest a statistically significant positive effect. Preselected classical music is the most widely recognized effective genre of music for anxiolysis and reducing heart rate. The data also strongly indicates that the intervention carries no risk, is

cost-effective, is easily implemented, and is well received by clinicians and patients. Therefore, based on the criteria set forth by Cullen et al. (2018), there is sufficient evidence to design a pilot for a clinical practice change to implement music as an intervention for anxiolysis and heart rate reduction in the parturient undergoing cesarean section.

Implementation

Improving the quality of care specific to a healthcare concern is the focus of QI, and having a plan can increase the likelihood of success for the project team (Finkelman, 2022). This QI project aims to improve anxiety and decrease associated tachycardia in the parturient undergoing cesarean section. To achieve its goals, the team plans to implement classical music intervention in the intraoperative period.

Step 5: Design and Pilot the Practice Change

This project utilizes existing evidence identified in the literature search, analysis, and synthesis to implement EBP guidelines. The project team will seek institutional review board (IRB) approval before implementing the project. Step five in the Iowa Model focuses on designing and initiating the proposed practice change in a representative population group derived from the literature review on a trial basis, a process known as piloting. During the piloting phase, the novel intervention or procedure is tested, monitored, evaluated for effectiveness, and adjusted, adopted, or abandoned based on the outcomes.

Setting

The setting for the proposed EBP change is a high throughput obstetric and gynecologic unit within a large, inner-city, comprehensive teaching hospital located in Southwest Ohio with a Level 1 Trauma Center designation. The maternal population is culturally and ethnically diverse,

encompassing low-risk pregnancies and complex high-risk maternal-fetal conditions. The population and setting are ideal for piloting the proposed practice change.

Population

Inclusion criteria include willing, literate primigravida women greater than 18 years posted for scheduled cesarean delivery of a gestationally aged fetus of 38 to 42 weeks with no known anomalies and under neuraxial anesthesia. The exclusion criteria are women with known serious comorbidities, emergency cesarean section, hearing impairment, history of psychiatric disorder, hypertensive disorders, tachyarrhythmia, insulin-dependent diabetes mellitus, intrauterine growth retardation, in utero fetal death, known fetal anomalies, premature rupture of membranes, and unwillingness to participate.

Methods

The Iowa Model suggests that piloting occurs over four phases. The first two phases focus on creating project awareness, building knowledge and commitment, disseminating credible evidence for the proposed change, and preparing all groups for change. In contrast, the third and fourth phases focus on implementing the intervention on a trial basis, trending results, and seeking clinician feedback (Cullen et al., 2018).

The pilot for this QI project will occur over two months and include 50 consenting consecutive patients presenting to the piloting unit for cesarean section under neuraxial anesthesia. To commence the pilot, the project team will give a 30-minute presentation to all CRNAs, anesthesiologists, obstetric nurses, IT personnel, and nurse informaticians regarding a summary of the existing literature, the purpose of the project, and expected outcomes. The education will also encompass patient inclusion and exclusion criteria.

The project team will then educate each department regarding expected roles during regular business hours in before-shift huddles. The IT department will design and optimize the electronic medical record (EMR) workflow to minimize disruption to standard workflow and promote adherence to expectations. The design must ensure that anesthesia providers can document the STAI scores. The IT department will also add an area for anesthesia providers to report when patients refuse the intervention or when the intervention is not applied following the project guidelines. For example, the surgeon requests that the circulating nurse turn off the music before the end of the procedure or that the circulator play music other than classical music.

Preoperative nurses will collect maternal heart rates in the preoperative area before exposure to music intervention in the operating theatre. The nurse will then record the maternal heart rate in the EMR accordingly. The anesthesia provider will be responsible for obtaining consent from the patient to play classical music in the preoperative area. The anesthesia provider will administer the STAI questionnaire after obtaining consent and before exposure to the music intervention. The STAI questionnaire will be administered during the typical anesthesia preoperative interview to minimize disruption to typical workflow. The anesthesia provider will then record the pre-intervention STAI in the EMR.

Following the obtained patient consent, the anesthesia provider will inform the circulating nurse of the patient's approval for the music intervention. The circulating nurse will play classical music via the operating suite’s stereo system at a volume that distracts the patient from the stimulating noises typical of the OR environment but allows for adequate communication between the patient, providers, and significant others if present. The music will be played throughout the entire surgical procedure, including during the administration of neuraxial anesthesia and until the closure of the abdominal incision. During the intraoperative

period, the anesthesia provider will collect and record maternal vital signs, including heart rate, in the EMR according to standard procedure. The anesthesia provider will also document whether the music intervention was applied according to the project guidelines. After transporting the patient to the recovery area, the anesthesia provider will administer the post-intervention STAI and record the scores in the EMR.

The nurse informatician from the informatics and QI department will collect pre- and post-intervention data, such as STAI scores and maternal heart rates, from the charts of the 50 patients included in the pilot. To determine project outcomes, the nurse informatician will then compare pre- and post-intervention heart rates and STAI scores. At the conclusion of the pilot, the nurse informatician will present results to the rest of the project team and key stakeholders.

After trialing the intervention, the project team will review post-implementation data and seek provider feedback. To elicit clinician feedback, the QI team will meet to discuss what went well and areas for improvement. The team will also post QR codes that link to an anonymous survey (Appendix E) regarding the clinicians' perception of the pilot throughout the obstetric unit, nurses' station, and breakrooms. The survey will assist the team in obtaining feedback from providers who cannot attend in-person meetings and those uncomfortable providing feedback in a group setting.

Budget

The total estimated cost for the QI project is $15,209.50. The primary cost for the proposed QI project is wages for staff education. Therefore, the total cost of implementing the project is highly dependent upon the size of the hospital and obstetric unit.

The estimated time to educate the anesthesia department is one hour per provider. Current mean anesthesiologist earnings are $145.66 per hour (United States Bureau of Labor

Statistics, 2023a). Current mean CRNA earnings are $98.93 per hour (United States Bureau of Labor Statistics, 2023b). The piloting hospital employs many anesthesia providers via a private anesthesia group: 40 anesthesiologists and 60 CRNAs. Given the anesthesia department's size and the providers' estimated earnings, the estimated cost to educate them is $11,762.20.

The time necessary to educate the registered nurses in the obstetric department is one hour per nurse. The obstetric department employs approximately 60 nurses with an average hourly wage of $42.80 (United States Bureau of Labor Statistics, 2023c). The estimated cost to educate the obstetric department is $2,568.

The project team utilizes two nurse informaticists to extract and compile data from patient charts. The time to educate the nurse informaticists is one hour per nurse. The QI team also accounts for 12 hours of data extraction, compilation, and presentation by the nurse informaticists. Using the average nurse wage above, the estimated associated costs for the nurse informaticist are $599.20.

The QI project also employs the IT department for EMR modification. The time to educate two IT personnel is one hour per employee. An estimated time to complete the necessary EMR modifications is eight hours. The median wage for health information technologists is $28.01 per hour (United States Bureau of Labor Statistics, 2023). The estimated associated costs for the IT department are $280.10.

The QI team does not account for sound equipment costs since the ORs already have stereo systems. The QI project also uses a free music streaming service, so there is no cost associated with obtaining music tracks. The QI team does not account for any costs for collecting maternal heart rates, administering the STAI and recording scores, or playing the music in the OR since the amount of time to complete the steps is trivial or already occurs in the

standard workflow. Furthermore, due to the prior availability at the proposed facility, the QI team does not account for the cost of purchasing statistical software.

Timeline

The total time to implement the QI project at the proposed facility is six months. The QI team will assemble teams in weeks one and two. In weeks three and four, the team will review the most up-to-date literature and conduct a needs assessment for their specific population. After reviewing the literature and deciding to commence the project based on the needs of their patients, the team will focus on obtaining the necessary approvals. Obtaining IRB approval and ethics committee support, if necessary, will take place during weeks five and six.

Once the team obtains the necessary approvals, education will be rolled out to the different staffing departments. Informal education regarding the project occurs in weeks seven and eight. During the informal education, the team disseminates general information about the upcoming project via huddles, informal staff meetings, the intranet, and newsletters. After generating awareness, team leaders will begin the formal education process. The formal education process occurs during weeks nine, 10, and 11.

Next, the team will focus on preparing for the project's go-live. During weeks 12 and 13, the team will prepare ORs for playing music if not equipped with sound systems, test the sound systems, make necessary changes to the EMR, and ensure access to a music streaming service. After the team makes all the required preparations, the project will move into the piloting phase during weeks 14-21. The pilot will include 50 consecutive patients who meet the inclusion criteria and present during the piloting timeframe. If 50 patients present in a shorter timeframe than expected, the remaining timeline within the project will advance accordingly. Following the pilot in weeks 22 and 23, the QI team elicits provider feedback and compiles, reviews, and

analyzes post-implementation data. In week 24, the team presents the post-implementation data to key stakeholders.

Once all of the data from the pilot is analyzed, the team can decide whether to maintain the intervention as is, adjust it, or abandon it. The decision process occurs in week 24. In weeks 25 and 26, the QI team disseminates the project results to the anesthesia department, obstetrics department, and the Otterbein nurse anesthesia program.

Monitoring Outcomes

To monitor the effectiveness of classical music in the proposed population, the QI team utilizes various statistical and qualitative tools to analyze the data collected during the pilot. The first tool the QI team utilizes is descriptive statistics. The QI team uses calculated STAI scores and heart rates collected before and after the music intervention to assess the overall changes. The QI team expects a reduction in both outcomes following the implementation of classical music.

The team uses standard deviation to supplement the data from measuring STAI and heart rate averages. The QI team will calculate the standard deviation for STAI and heart rates before and after implementing the intervention. By calculating the standard deviation before the intervention, the QI team can gauge how varied initial participant STAI scores and heart rates are. By calculating the standard deviation following classical music intervention, the team can measure the response variability among participants.

Furthermore, the team will compare the pre- and post-intervention standard deviation. If the standard deviation decreases following the intervention, the team can speculate that classical music leads to consistent reductions in STAI scores and maternal heart rate. Conversely, if the

standard deviation increases or remains high after the group's exposure to classical music, the results suggest that individual responses to music are variable.

The QI team will also use the paired t-test to compare the before and after effects of the music intervention. Using the paired t-test, the QI team can determine if classical music has a statistically significant impact on maternal anxiety and heart rates. This project uses an alpha level of 0.05 to determine statistical significance.

The QI team also collects qualitative data through provider surveys following the pilot. The team will analyze the surveys for recurring themes in opinions of the effectiveness of the intervention. By examining qualitative data from the provider surveys, the QI team may be better equipped to formulate a plan for adjusting the intervention, if necessary. Additionally, using chart reviews, the QI team will collect data regarding intervention fidelity.

Decision Point 3 - Is Change Appropriate for Adoption in Practice?

Project objective number four of this project is to develop a comprehensive plan to adjust the guidelines if outcomes do not meet project expectations. Using data obtained from the pre- and post-implementation phases of the pilot, the project team will assess whether the intervention is appropriate for adoption in practice. If data from the pilot regarding processes and outcomes are unequivocally positive, the decision to sustain the practice change and begin the full-scale implementation phase is easy (Cullen et al., 2018). However, the most ideal circumstances rarely occur in practice. Cullen et al. (2018) give indications that suggest the team should consider alternatives to the practice change. For this project, no improvement in maternal anxiety or intraoperative heart rates and negative feedback from patients or providers are indicators that necessitate considering modifying the guidelines.

Adjustment Plan

If there is little or no improvement in the outcomes, the intervention is not executed according to the guidelines, or the intervention is not well received by patients or providers, the team must consider alternatives to the practice change. For example, an anticipated challenge is provider resistance to the practice change due to their perception of time constraints or added workload with the administration of the STAI questionnaire. In this scenario, if members are only mildly resistant or if the resistance lies with only select providers, the QI team could consider reinforcing the practice change by presenting the data suggesting the intervention's effectiveness. Alternatively, the QI team could demonstrate how little additional time the STAI questionnaire requires when administered during the typical preoperative interview. If most providers share the same sentiment, the QI team can address the concerns by seeking approval for an added team member to assist with completing tasks that providers perceive as burdensome. However, adding another provider will add additional costs to the QI project.

Another anticipated obstacle is negative feedback regarding the lack of autonomy from patients from not being given a choice in music. In this scenario, the project team may consider adding other genres of slow-tempo relaxing music and allowing patients to choose from a list of those genres. By allowing patients a choice but limiting the choice to relaxing music, the QI team enhances patient autonomy but limits the negating effects of listening to stimulating music. Alternatively, the QI team may consider allowing the patient to curate their playlist or choose a genre they prefer.

If the measured outcomes worsen or are unchanged after the implementation of the music intervention, the QI team must determine if there are intervention fidelity issues before deciding that the intervention is ineffective. For example, if the QI team determines through data

collection and chart audits that the circulating nurse is not playing the music during the entire procedure, the problem likely lies with the implementation of the intervention and not the intervention itself. In that case, the QI team will first seek feedback from team members regarding potential barriers to implementation. If no obstacles exist, the QI team will reeducate non-compliant team members to enhance intervention fidelity. If the non-compliant team member remains non-compliant despite receiving additional education, the project team will follow institutional policies regarding the disciplinary process.

The intervention may also be ineffective despite perfect execution and adherence to the implementation plan. In this case, the team must consider modifying the intervention or guidelines. Suppose the circulator plays the music according to the guidelines; however, the patient can still hear the harmful sounds of the OR, or the circulator must play the music at a volume that impairs staff communication to prevent the patient from hearing noxious sounds. In that case, a possible modification to the intervention is the application of music through headphones rather than through OR stereo systems. Playing music through the headphones would facilitate isolating the patient from the sounds of the OR and allow providers to communicate. If, after considering modifying the guidelines and intervention, the team determines that the intervention is ineffective or worsens outcomes, the project team will abandon the practice change, and full-scale implementation will not occur.

Indications that the team should move forward with adopting the change into practice, according to Cullen et al. (2018), are improvements in outcomes, clinician and patient acceptance, and barriers are limited. For this project, statistically significant improvement in STAI scores, maternal heart rate, lack of intervention side-effects, and clinician and patient acceptance will be considered adequate for sustaining the practice change.

Step 6: Integrate and Sustain Practice Change

If the team determines from the data obtained through the pilot that the practice change benefits the target population, the next step is to pursue full-scale integration and sustained use. Cullen et al. (2018) suggest several strategies to promote integration and maintenance of the practice change. Using a multipronged approach will likely achieve the best results. The first strategy the team will employ to solidify the practice change is utilizing clinician feedback from the piloting process to improve the guidelines where appropriate. Reviewing clinician feedback regarding the implementation of the pilot will help determine which strategies the team should repeat, modify, discard, or add (Cullen et al., 2018). Utilizing clinician feedback also signals that the team values input and garners buy-in. The second strategy the team will apply is an electronic practice reminder. The IT department will create a practice reminder pop-up that will auto-populate during the standard admission process. The pop-up will remind the preoperative nursing staff and anesthesia providers to offer music intervention to the patient. Pop-up reminders provide real-time direction to busy providers and can help reduce errors and limit forgotten steps (Cullen et al., 2018). Financial incentives are also powerful tools for influencing clinicians to adhere to practice changes. However, this project has little potential for generating revenue; therefore, offering economic incentives is impractical.

Step 7: Disseminate Results

Step seven of the Iowa Model instructs the team to share the results of the EBP project. The team will first disseminate the results of the EBP project internally. Internal dissemination commonly occurs following the evaluation of pilot data. Cullen et al. (2018) suggest that the team disseminates results using varied methods such as formal communication during shared governance meetings, posting project posters, and communicating project summary documents

in newsletters, blogs, or intranet. This project team will share results internally via a project poster.

After the team analyzes the results of the EBP project and is confident that the results are positive, external results will be shared. External sharing of EBP projects expands nursing knowledge, encourages other organizations to make similar changes, and helps to further the goal of improving the lives of the patients we serve (Cullen et al., 2018). The team has multiple options for disseminating externally, for example oral presentations, poster presentations, or peer-reviewed publications. However, conveying results externally is often more complicated than internal sharing. Each institution has an individualized policy for disseminating EBP project results.

Limitations and Barriers

Several limitations exist for this project. Despite music having a proven clinical and cost-effective track record, it has limited potential for generating revenue. Therefore, garnering buy-in from hospital administrators may pose challenges to large-scale adoption.

The optimal timing of administering STAI questionnaires and accurately measuring maternal anxiety is also challenging. For example, women may experience waxing and waning levels of anxiety at different points along the surgical timeline. However, there is no method for continuously measuring anxiety, and administering STAI questionnaires at two predetermined points may not accurately reflect women's experience or provide a precise gauge of an implemented intervention's effectiveness.

Patient safety is also a potential barrier. Music's effectiveness is partly due to its ability to distract mothers from noxious sounds within the OR. However, if music is played over OR stereo systems at a volume loud enough to distract mothers, it could also distract medical

personnel from variable pitch tones used to signify a change in oxygen saturation, heart rate, or blood pressure.

The optimal type of music for achieving anxiolysis is also currently unknown. Research shows that, in general, music with a slower tempo is desired. However, cultural differences and patient preferences may play a role in the effectiveness of music intervention from different genres.

Future Direction

Further research on optimizing music intervention is suggested. For example, additional research should focus on comparing the effectiveness of different types of music. Allowing patients to choose the type of music or to curate a playlist for delivery and comparing their anxiety levels against patients who listen to preselected music may provide insight into whether genre plays a role in the intervention's effectiveness. Comparing methods of application of music intervention could also help determine the optimal delivery of the intervention to the patient while limiting safety hazards. Future research could compare the effectiveness and safety profiles of music played over OR stereo systems and music played via headphones to help develop guidelines for applying music intervention within the OR. Determining the optimal timing of applying the music intervention is another possible study area.

Conclusion

Preselected classical music intervention is a safe, effective, affordable, easily implemented, non-pharmacological means of providing women who are delivering via cesarean section under neuraxial anesthesia relief from anxiety. Music intervention's effect on maternal heart rates before, during, and after delivery is variable. However, most data suggest that music intervention effectively lowers maternal heart rates during the intraoperative period. While

preselected classical music intervention is shown to be effective in the perioperative period, specific recommendations on the timing or methods of applications cannot be made. Also, given the uniqueness of the population studied, generalizations across populations are not possible. However, music intervention may likely be effective in relieving anxiety in other populations where administering pharmacological anxiolysis is not possible or is not suggested.

Summary

Primigravida women undergoing elective cesarean section under neuraxial anesthesia are a unique population that frequently suffers from disproportionate levels of anxiety when compared to other surgical populations. Given their gravid status, providing them with conventional pharmacologic therapy poses unique challenges and hazards. However, preselected classical music intervention provides CRNAs an effective, non-pharmacologic, safe, affordable, holistic avenue to achieving anxiolysis and promoting improved outcomes for the vulnerable population.

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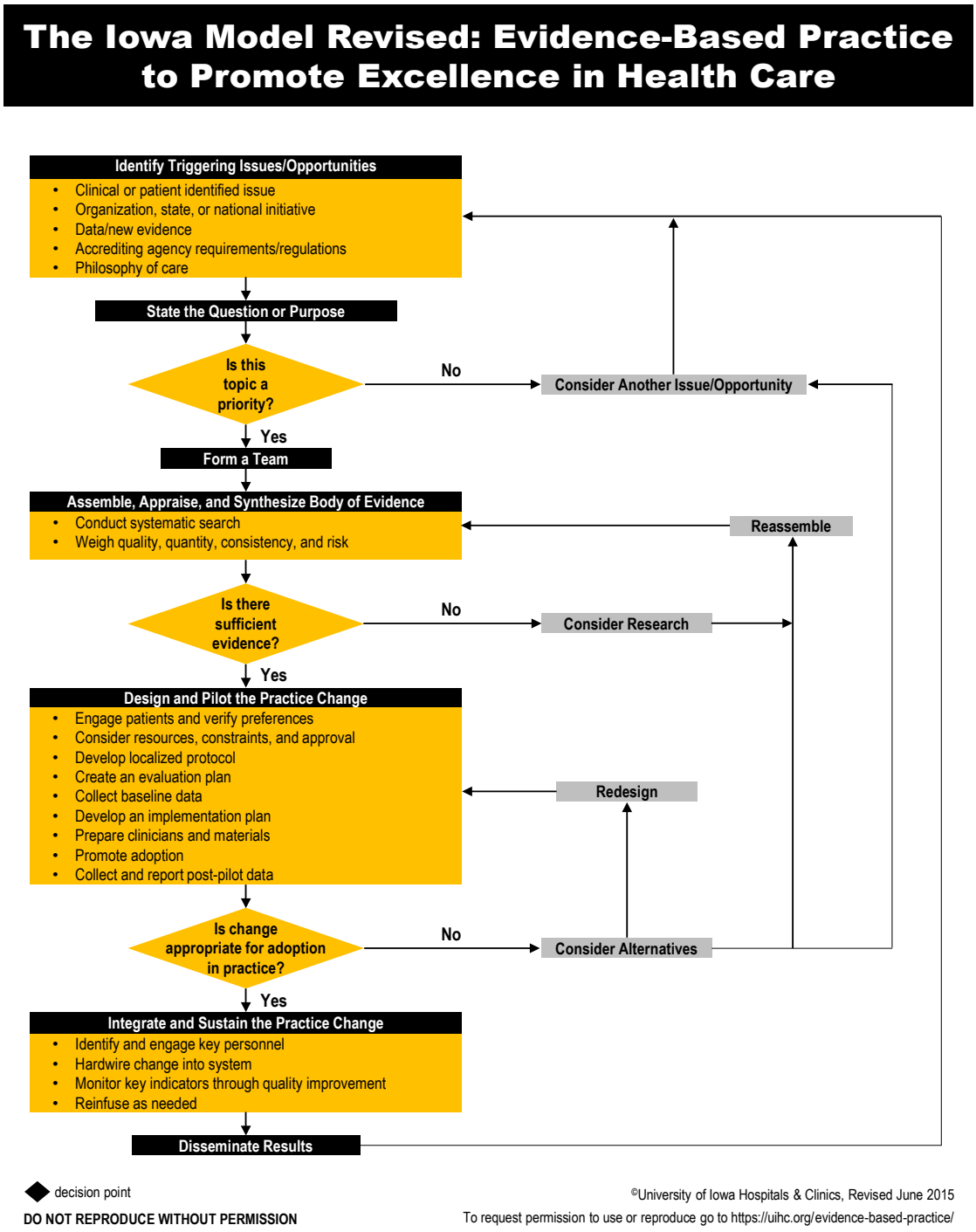
Appendix A

STAI Questionnaire

1. I feel calm
2. I feel secure
3. I feel tense
4. I feel strained
5. I feel at ease
6. I feel upset
7. I am presently worrying over possible misfortunes
8. I feel satisfied
9. I feel frightened
10. I feel uncomfortable
11. I feel self-confident
12. I feel nervous
13. I feel jittery
14. I feel indecisive
15. I am relaxed
16. I feel content
17. I am worried
18. I feel confused
19. I feel steady
20. I feel pleasant

Appendix B

The Iowa Model



Appendix C

Iowa Model Permission

From: **Kimberly Jordan - University of Iowa Hospitals and Clinics** survey-bounce@survey.uiowa.edu
Subject: [External Email] Permission to Use The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care
Date: July 7, 2023 at 11:50 AM
To: garcia9@otterbein.edu

You have permission, as requested today, to review and/or reproduce *The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care.* Click the link below to open.

Iowa Model - 2015.pdf

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Reference: Iowa Model Collaborative. (2017). Iowa model of evidence-based practice: Revisions and validation. *Worldviews on Evidence-Based Nursing, 14(3), 175-182. doi:10.1111/wvn.12223*

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Appendix D

Literature Review Table

APA Citation: Abarghoee, S. N., Mardani, A., Baha, R., Aghdam, N. F., Khajeh, M., Eskandari, F., & Vaismoradi, M. (2022). Effects of Benson relaxation technique and music therapy on the anxiety of primiparous women prior to cesarean section: A randomized controlled trial. *Anesthesiology Research & Practice*, 1–9. https://doi.org/10.1155/2022/9986587								
Conceptual Framework or Model	***Design or Method***	***Sample & Setting***	***Major Variables Studied & their Definitions, if any***	***Outcome Measurement(s)***	***Data Analysis***	***Findings***	***Level of Evidence***	***Quality of Evidence: Critical Worth to Practice***
N/A	RCT	105 primiparous, fully conscious, Farsi literate women undergoing cesarean section in 4 public hospitals in an urban area of Iran. Excluded patients with a history of surgical procedures, mental illness, anxiety disorder, hearing impairment, and previous use of relaxation methods. Patients taking herbal or medical sedatives or anxiety scores above 31 on the State Anxiety Inventory (SAI) were excluded. Changes in the women's or fetuses' hemodynamics, the need for additional medical care before the cesarean, and unwillingness to cooperate also led to exclusion.	IV1= Benson Relaxation Technique IV2= Preselected non-verbal music "Weightless" played for 20 minutes through an MP3 player DVs= Anxiety	State Anxiety Inventory = Cronbach's Alpha 0.90 and Test-Retest 0.62 Demographic questionnaire	Descriptive statistics, one-way ANOVA, Chi-squared test, paired t-test, Cohen's *d*	**Intragroup findings** Benson relaxation technique had lower anxiety after the intervention ($t=5.61$, $p<0.001$, $d=0.94$) Music decreased anxiety after intervention ($t= 3.83$, $p=0.001$, $d= 0.64$) No difference in the control group after interventions **Between-group findings** No difference in anxiety before interventions Music and Benson relaxation technique	I	**Quality of evidence** **A** **Strengths** Sufficient sample size, consistent recommendations with existing literature, definitive conclusions **Limitations** Interventions could not be implemented in a very quiet environment, which may have impacted their effectiveness. Anxiety was measured subjectively using self-report questionnaire **No risks, side effects, and both interventions are cost-effective, non-invasive, and**

						groups had lower anxiety scores following interventions when compared to control. Music (MD= -5.25, p=0.03) Benson relaxation technique (MD= -6.00, p=0.01)		**easily implemented**

APA Citation: Drzymalski, D. M., Lumbreras-Marquez, M. I., Tsen, L. C., Camann, W. R., & Farber, M. K. (2020) The effect of patient-selected or preselected music on anxiety during cesarean delivery: a randomized controlled trial. *The Journal of Maternal-Fetal & Neonatal Medicine, 33:24*, 4062-4068, DOI: 10.1080/14767058.2019.1594766

Conceptual Framework or Model	***Design or Method***	***Sample & Setting***	***Major Variables Studied & their Definitions, if any***	***Outcome Measurement(s)***	***Data Analysis***	***Findings***	***Level of Evidence***	***Quality of Evidence: Critical Worth to Practice***
N/A	RCT	150 Parturients undergoing elective cesarean section. Setting unknown Exclusion criteria were unavailable since the full text was not available.	IV1=Patient selected music (Pandora) IV2=Preselected Mozart DV1= Preoperative Anxiety DV2= Postoperative anxiety DV3= Postoperative pain DV4= Total patient satisfaction scores	Scale not available	Not described	Preselected Mozart music was associated with decreased post-intervention pre-procedure anxiety scores (3.5 ± 2.5 vs. 4.6 ±2.5; mean difference -1.1; 95% confidence interval -2.2 to -0.1; p = 0.03). Preselected Mozart music had decreased post-operative pain when compared to control (0.6 ± 1.3 vs. 1.4 ± 1.9; mean difference -0.8; 95% confidence interval -1.4 to -0.1; p = 0.03) No statistical difference between control and patient-selected music for pre-procedure anxiety Neither type of music decreased postoperative anxiety.	I	**Quality of Evidence** **C** **Strengths** N/A **Limitations** Abstract only Methods and statistical analysis information are unavailable.

						Total patient satisfaction scores did not differ among the groups		

APA Citation: Handan, E., Sahiner, N. C., Bal, M. D., & Dissiz, M. (2018). Effects of music during multiple cesarean section delivery. *Journal of the College of Physicians and Surgeons--Pakistan : JCPSP*, *28*(3), 247–249. https://doi.org/10.29271/jcpsp.2018.03.247

Conceptual Framework or Model	***Design or Method***	***Sample & Setting***	***Major Variables Studied & their Definitions, if any***	***Outcome Measurement(s)***	***Data Analysis***	***Findings***	***Level of Evidence***	***Quality of Evidence: Critical Worth to Practice***
N/A	RCT	60 volunteer pregnant women undergoing second cesarean delivery at Karaman Public Health Hospital in Turkey Excluded patients with communication barriers, hearing deficit, > five years between first and current cesarean delivery, patients with obstetrical problems, and psychiatric diagnoses.	IV1= Patient selected music played during cesarean section at patient's desired volume via stereo DV1= Anxiety	Demographics questionnaire form Visual Analog Scale for Anxiety 0-10 Direct measurement for vital signs	Descriptive statistics, T-test, Chi-square test	Reduced visual analog scores for anxiety (p=0.002) Decreased heart rate postoperatively in women listening to music compared to their preoperative heart rates (p<0.05) Statistically significant increase in oxygen saturation in the music group (p=0.017) while there was a statistically significant decrease in oxygen saturation in the control group (p=0.043) Only the music group had reductions in systolic blood pressure pre and postoperatively (p=0.003)	I	**Quality of Evidence** **B** **Strengths** Sample size is adequate, statistical analysis data is transparent **Limitations** Authors report that physiological parameters planned for preop, periop, during mother-baby contact, and postop were not analyzed during the operation since immediate mother-baby contact was not possible at the hospital where the study was conducted. No pain assessments were conducted due to the assumption that pain would not be present under the anesthesia technique. **No adverse effects, inexpensive, and easy to use.**

APA Citation: Halder, A., Kumar, A., Hariharan, U., & Manjhi, B. (2022). Effect of perioperative music therapy/medicine on postoperative pain in women undergoing elective lower segment caesarean section delivery under spinal anaesthesia: A case-control study. *Journal of Clinical & Diagnostic Research*, *16*(2), 10–15. https://doi.org/10.7860/JCDR/2022/51555.15980

Conceptual Framework or Model	***Design or Method***	***Sample & Setting***	***Major Variables Studied & their Definitions, if any***	***Outcome Measurement(s)***	***Data Analysis***	***Findings***	***Level of Evidence***	***Quality of Evidence: Critical Worth to Practice***
N/A	RCT	60 consecutive parturient women scheduled for elective lower segment cesarean section (LSCS) under spinal anesthesia The study was conducted in the Department of Anesthesiology at Atal Bihari Vajpayee Institute of Medical Sciences and Dr. RML Hospital in New Delhi, India Excluded patients with comorbidities such as hepatic, renal, cardiac, respiratory, and psychiatric illnesses such as depression, anxiety, and neurosis. Patients with allergies to drugs such as local anesthetics and hearing deficits were also excluded.	IV1= Music played through headphones for 20 minutes in the preoperative, intraoperative, and postoperative periods for a total of 60 minutes. (If patients had a preference, they were allowed to listen to that music. If they had no preference, they were asked to opt from Vocal (Indian classical, semi-classical, folk, and light music) or instrumental (single or mixed musical instrument) lists. DV1= Anxiety DV2= Pain	Verbal rating scale for pain (none, mild, moderate, or severe) Visual analog scale for pain (0-10) Numeric rating scale for pain (0-100) Direct measurement for vital signs. Time to first rescue analgesia.	Mann-Whitney U-Test	Decreased respiratory rate at 60 minutes ($p = 0.04884$) after PACU arrival Decreased heart rate at 30 ($p = 0.0278$), 45 ($p = 0.0151$), and 60 minutes ($p = 0.02852$) after PACU arrival Decreased visual analog pain scores 1 ($p = 0.0003$), 2 ($p = 0.00152$), and 3 hours ($p = 0.02444$) after PACU arrival Delayed time for first rescue analgesia by 29 minutes (181 ± 30.09 vs. 152 ± 46.56; $p = 0.01732$)	I	**Quality of Evidence** **A** **Strengths** Adequate sample size, statistical analysis of data is available and clear, clear and definitive conclusions **Limitations** Authors note the study was unable to carry out estimation of various neurotransmitters as well as hormones involved in cardiorespiratory, pain, and stress responses in relation to the music intervention. **No risks, no side effects, cost-effective, non-invasive, and easily implemented**

APA Citation: Hepp, P., Hagenbeck, C., Gilles, J., Wolf, O. T., Goertz, W., Janni, W., Balan, P., Fleisch, M., Fehm, T., & Schaal, N. K. (2018). Effects of music intervention during caesarean delivery on anxiety and stress of the mother a controlled, randomised study. *BMC Pregnancy and Childbirth*, *18*(1), 1–8. https://doi.org/10.1186/s12884-018-2069-6

Conceptual Framework or Model	*Design or Method*	*Sample & Setting*	*Major Variables Studied & their Definitions, if any*	*Outcome Measurement(s)*	*Data Analysis*	*Findings*	*Level of Evidence*	*Quality of Evidence: Critical Worth to Practice*
N/A	RCT	304 patients undergoing cesarean section under regional anesthesia at the University Hospital Dusseldorf, Germany Excluded patients with hearing deficits, serious comorbidities (physician discretion), increased surgical risk, serious fetal conditions, generalized anxiety disorder, or other serious mental alterations.	IV1= Music intervention played on a CD player. Music played was from a pool of 60 songs from 4 different genres. Music was continuously played at a volume of 55 decibels and had a tempo of 60-80 beats per minute. DV= Anxiety	State-Trait Anxiety Inventory (STAI) Visual Analog Scale for Anxiety (VAS-A) Direct measurements of salivary cortisol and alpha-amylase. Direct measurements of vital signs.	Mixed-factorial analysis of variances, Independent sample t-tests	Decreased State-Trait Anxiety Inventory (STAI)-state score (31.56 vs. 34.43; p = 0.004) Decreased Visual Analog Scale (VAS) for anxiety scores (1.27 vs. 1.76; p = 0.018) at the time of suture Decreased salivary cortisol increases from admission to skin suture (12.29 vs. 16.61 nmol/L; p = 0.043) Decreased systolic blood pressure (130.11 vs. 136.19 mmHg; p = 0.002) at skin incision Decreased heart rate (99.40 vs. 92.57 beats/minute; p = 0.049) at skin incision 95.5% of the music group reported they would listen to music again if undergoing cesarean again. 89.7% of patients reported making the procedure more enjoyable.	I	**Quality of Evidence** **A** **Strengths** Firm conclusions, large sample size, high acceptance of the intervention, and statistical analysis are clear and available. **Limitations** Authors note a lack of comprehensive understanding of the development of anxiety throughout the procedure due to a lack of measuring points. Blinding of staff was impossible since music was played in the environment and not in headphones. There is a lack of data on the relationship and roles of the healthcare staff and the information sharing with the women undergoing the procedure. **Music is an inexpensive, safe, and easily implemented intervention.**

						73.4% thought the music calmed them.		

APA Citation: Horasanlı, J. E., & Demirbaş, N. (2022). Effects of music intervention during cesarean section on the level of the mother's anxiety: A randomized controlled study. *Erciyes Medical Journal / Erciyes Tip Dergisi*, *44*(3), 257–262. https://doi.org/10.14744/etd.2021.64188

Conceptual Framework or Model	***Design or Method***	***Sample & Setting***	***Major Variables Studied & their Definitions, if any***	***Outcome Measurement(s)***	***Data Analysis***	***Findings***	***Level of Evidence***	***Quality of Evidence: Critical Worth to Practice***
N/A	RCT	Forty-nine pregnant adult women with single full-term fetuses undergoing cesarean section under regional anesthesia in Turkey. Excluded patients with hypertensive disorders, insulin-dependent diabetes mellitus, intrauterine growth retardation, pregnancy into the 41st week, premature rupture of membranes, multiple pregnancies, in utero fetal death, known fetal anomalies, hearing impairment, or psychiatric disorders.	IV1= Sufi music with a slow rhythm of 60-72 beats per minute, low to medium tone, and a harmonious melody played via headphones before applying the spinal anesthetic and throughout the operation. DV1= Anxiety	State-Trait Anxiety Inventory (STAI) score State-Trait Anxiety Inventory-State (STAI-S) score Direct measurement of vital signs	Descriptive statistics, Kolmogorov-Smirnov test, Chi-squared test, independent t-test, paired sample t-test.	Lower State-Trait Anxiety Inventory- State (STAI-S) scores in the music group post-operatively when compared to control (35.88 ± 5.39 vs. 42.14 ± 3.75; $p < 0.001$). Statistically significant decrease in heart and respiratory rates postoperatively within the music group ($p < 0.001$). Controls experienced no change in vital sign parameters, and no statistical difference was seen across groups. The music group demonstrated a statistically significant drop in anxiety levels when comparing pre and post-procedure anxiety scores (45.58 ± 4.60 vs. 35.88 ± 5.39; $p < 0.001$). Controls experienced no change in anxiety scores pre and post-procedure	I	**Quality of Evidence** **A** **Strengths** Adequate sample size, statistical analysis of data is available and clear, clear and definitive conclusions **Limitations** Authors report the strongest limitation is the subjective nature of determining anxiety levels postoperatively. They also report that the immediate relief following birth may cause mothers to remember or report their level of anxiousness during the procedure. **Authors concluded music is a low-cost, accessible, highly accepted, and effective technique for mitigating anxiety.**

APA Citation: Kaur, H., Bansal, G., Sreehari, S., Shukla, V., Harsh, H., & Pareek, R. (2023). The effect of music on serum cortisol levels and anxiety in patients undergoing lower segment cesarean section under spinal anesthesia: A randomized controlled interventional study. *Journal of Obstetric Anaesthesia & Critical Care*, *13*(1), 87–93. https://doi.org/10.4103/JOACC.JOACC_63_22								
Conceptual Framework or Model	***Design or Method***	***Sample & Setting***	***Major Variables Studied & their Definitions, if any***	***Outcome Measurement(s)***	***Data Analysis***	***Findings***	***Level of Evidence***	***Quality of Evidence: Critical Worth to Practice***
N/A	RCT	60 pregnant women 18-35 years undergoing elective lower segment cesarean delivery between 0800 and 1100 Excluded patients with American Society of Anesthesiologist classes III and IV, hearing impairment, chronic pain, psychiatric or memory disorders. Patients taking drugs that impact the hypothalamic hypophyseal system or the sympathetic nervous system were excluded. Patients with a history of drug abuse, addictions, or steroids and professional musicians were also excluded. If the patient's first spinal block was only partial or failed, had pain during surgery, hypotension requiring vasopressors, laboring patients, nausea, vomiting, post-partum hemorrhage patients needing multiple uterotonics, and patients with severe shivering were excluded.	IV1= Patient selected music from 3 genres (folk music, Hindi film songs, and religious music) played via MP3 player after spinal anesthetic application and until the end of the cesarean procedure. DV1= Anxiety	Visual analog score for anxiety (VASA) Serum cortisol Direct vital sign measurement	Descriptive statistics, t-test, paired t-test, ANOVA, Chi-square test	Decreased Visual Analog Scores for anxiety post-procedure (5.77 ± 0.73 vs. 4.90 ± 0.66; p <0.001) The music group did not experience a statistically significant rise in mean serum cortisol (32.44 ± 14.42 ug/dl vs. 33.59 ± 12.74 ug/dl; p = 0.583) The control group had a statistically significant rise in mean serum cortisol (25.24	I	**Quality of Evidence** **A** **Strengths** Authors report the safety of using music as an intervention as a decisive advantage. They also felt that using patient-selected music was a strength and that it led to more significant reductions in anxiety **Limitations** Authors report that music delivery to the patient was subpar with current technology. **No adverse effects, simple, and highly available**

						± 13.54 ug/dl vs. 30.22 ± 17.04 ug/dl; p 0.023)		

APA Citation: Khaity, A., Tarek, M., Alabdallat, Y., Albakri, K., Gabra, M. D., & Ghaith, H. S. (2022). The effect of music intervention on anxiety and pain during cesarean delivery: A meta-analysis of 1513 patients. *International Journal of Medical Students*, *10*.

Conceptual Framework or Model	***Design or Method***	***Sample & Setting***	***Major Variables Studied & their Definitions, if any***	***Outcome Measurement(s)***	***Data Analysis***	***Findings***	***Level of Evidence***	***Quality of Evidence: Critical Worth to Practice***
N/A	Meta-Analysis of 13 RCTs Abstract only (Contacted author and full text is not currently available)	13 RCTs containing 1513 patients.	IV= Music played in the perioperative period for women undergoing cesarean section. DV1= Anxiety DV2= Pain	Unable to determine	Descriptive statistics (Standardized mean difference)	Decreased overall anxiety scores (standardized mean difference, -0.26; 95% confidence interval, -0.39 to -0.14; p < 0.0001) Decreased postoperative pain (standardized mean difference, -0.50; 95% confidence interval -0.74 to -0.26; p < 0.0001) Lower diastolic blood pressure (mean difference, -1.58; 95% confidence interval -3.11 to -0.04; p = 0.04) Lower intraoperative heart rate (statistics not disclosed).	I	**Quality of Evidence** **C** **Strengths** Very large sample size that the authors claim to contain all class I randomized control trials **Limitations** Statistical data and sources are unable to be verified.

APA Citation: Kurdi, M., & Gasti, V. (2018). Intraoperative meditation music as an adjunct to subarachnoid block for the improvement of postoperative outcomes following cesarean section: A randomized placebo-controlled comparative study. *Anesthesia: Essays & Researches*, *12*(3), 618–624. https://doi.org/10.4103/aer.AER_114_18

Conceptual Framework or Model	*Design or Method*	*Sample & Setting*	*Major Variables Studied & their Definitions, if any*	*Outcome Measurement(s)*	*Data Analysis*	*Findings*	*Level of Evidence*	*Quality of Evidence: Critical Worth to Practice*
N/A	RCT	189 women > 18 years undergoing emergency cesarean section under spinal anesthesia Excluded hearing/ear abnormalities and psychiatric disorders 7 Patients dropped from the study.	IV1= Soothing meditation music (Group M) played via headphones after application of spinal anesthesia until skin closure and dressing IV2= Binaural beat meditation music (Group B) played via headphones after application of spinal anesthesia until skin closure and dressing DV1= Pain DV2= Post-operative nausea and vomiting (PONV) DV3= Psychological well-being DV4= Anxiety	Visual Analog Scale for Pain (VAS) (0-10) Post-operative Nausea and Vomiting (PONV) impact scale Psychological well-being questionnaire Visual Analog Scale for Pain (VAS) (0-10)	Student's t-test, Mann-Whitney U-test, Chi-squared test	No difference in postoperative nausea and vomiting occurrence or severity. Decreased mean pain score for both music intervention groups at 6 (M vs. control p= 0.042) (B group vs. control p= 0.034) and 24 hours (M group vs. control p= 0.025) (B group vs. control p= 0.022) No statistical difference between intervention groups for pain scores. Greater mean time until first rescue analgesia for both music intervention groups (M group vs. control p= 0.031) (B group vs. control p= 0.026) No statistical difference	I	**Quality of Evidence** **A** **Strengths** Large sample size, statistical analysis is clear and available. Music is a good and simple option for improving patients' overall experience **Limitations** Lack of patient choice of music. Patients and observers were not blinded. Mothers could not hear their babies crying after being delivered because headphones had to remain applied until after suturing was complete. Communication between patients and healthcare providers was not possible. No hemodynamic monitoring intra or postoperatively **No adverse effects noted.**

						between interventio n groups for first rescue analgesia time. Decreased mean visual analog scores (VAS) for anxiety for both music interventio n groups at 1 (M group vs. control p= 0.031) (B group vs. control p=0.035), 6 (M vs. control p= 0.012) (B group vs. control p= 0.009), and 24 hours (M group vs. control 0.015) (B group v.s control p=0.021) No statistical difference between interventio n groups for anxiety. Increased mean psychologi cal well-being scale scores for music interventio n groups at 1 (M group v.s control p= 0.012) (B group .vs control p= 0.016), 6 (M group .vs control p= 0.021) (B group .vs control p= 0.012), and 24 hours (M group vs		

						control p= 0031) (B group vs control p= 0.046). No statistical difference between interventio n groups for psychologi cal well-being scores.		

APA Citation: Marwang, S., Passe, R., Aswan, R., Triananinsi, N., Iskandar, N., Ohorella, F., & Sikki, S. (2020). Effects of classical music therapy on anxiety level of caesarean section mother. *Medico-Legal Update*, *20*(3), 806–809.								
Conceptual Framework or Model	***Design or Method***	***Sample & Setting***	***Major Variables Studied & their Definitions, if any***	***Outcome Measurement(s)***	***Data Analysis***	***Findings***	***Level of Evidence***	***Quality of Evidence: Critical Worth to Practice***
N/A	Pre-experimental one group pre-test – post-test Quasi-experimental study	Thirty willing primigravida women scheduled for cesarean section at Syekh Yusuf Regional General Hospital in the Gowa district, Indonesia. Exclusion criteria not discussed.	IV= Anxiety DV= Music therapy	Hamilton Rating Scale (HARS)	Wilcoxon rank test	All 30 patients reported decreases in anxiety following exposure to music therapy (p=0.000; n=30)	III	**Quality of Evidence** **C** **Strengths** None **Limitations** Methods of implementing the music therapy are not discussed. Data and statistical analysis are not presented. Rating scale (HARS) not discussed. Overall, very little information was gleaned from the study.
APA Citation: Parodi, A., Fodde, P., Pellecchia, T., Puntoni, M., Fracchia, E., & Mazzella, M. (2021). A randomized controlled study examining a novel binaural beat technique for treatment of preoperative anxiety in a group of								

women undergoing elective caesarean section. *Journal of Psychosomatic Obstetrics and Gynaecology*, *42*(2), 147–151. https://doi.org/10.1080/0167482X.2020.1751607

Conceptual Framework or Model	***Design or Method***	***Sample & Setting***	***Major Variables Studied & their Definitions, if any***	***Outcome Measurement(s)***	***Data Analysis***	***Findings***	***Level of Evidence***	***Quality of Evidence: Critical Worth to Practice***
N/A	Double-blind RCT	60 Low-risk full-term women scheduled for elective cesarean section at Ospedali Galliera in Genoa, Italy. Excluded patients with psychiatric disorders, neurological impairment, epilepsy, deafness, drug or alcohol use during pregnancy, or insufficient reading level.	IV1= Dynamic Multip Spectrum Phase Shift (DMSPS) binaural beat music IV2= Identical music without DMSPS DV= Anxiety	State-Trait Anxiety Inventory Questionnaire (STAI-Y)	Kruskal-Wallis, Linear regression multivariate modeling, Chi-squared	The standard music group had a mean state anxiety level 6.3 points lower than the control (95% CI: -10.9 to -1.7, p= 0.008) The DMSPS group had a mean state anxiety level 10.1 points lower than control (95% CI: -14.8 to -5.5, p<0.001)	I	**Quality of Evidence** **B** **Strengths** Time and cost-effective with potential positive impacts on mother's experiences. Easily applied with minimal staff training. Fairly strong conclusions. Double-blinding. **Limitations** Impact on anesthetic requirements and patient satisfaction were not examined. Lack of clarity surrounding methods of implementing the interventions (time applied, duration) and timing of when the anxiety questionnaire was administered. **No adverse effects noted.**

APA Citation: Toker, E., Demirel, G., Doganer, A., & Karakucuk, S. (2021). Effects of Turkish classical music on postpartum pain and anxiety in cesarean deliveries: A randomized controlled trial. *Alternative Therapies in Health & Medicine*, *27*, 120–127.

Conceptual Framework or Model	***Design or Method***	***Sample & Setting***	***Major Variables Studied & their Definitions, if any***	***Outcome Measurement(s)***	***Data Analysis***	***Findings***	***Level of Evidence***	***Quality of Evidence: Critical Worth to Practice***
N/A	RCT	126 Healthy women > 18 years old who delivered healthy live newborns via cesarean	IV1- Classical Turkish music played for 30 minutes once per day starting on the day following cesarean section for two days	Visual analog scale (VAS) for pain Spielberger State-Trait Anxiety Inventory (S-STAI TX-1)	ANOVA, Tukey's, Tamhane's T2, Dunnet's, t-test, Kruskal Wallis H test, Dunn-Sidak test,	Both intervention groups had lower mean state anxiety levels than the control ($p < 0.001$)—no	I	**Quality of Evidence** **A** **Strengths**

		section in a tertiary hospital in a provincial center in Turkey. Excluded patients who did not agree to be in the study, had hearing deficits, were illiterate, had communication problems, or delivered stillborn.	IV2- Classical Turkish music played for 30 minutes twice per day starting on the day following cesarean section for two days DV1- Anxiety DV2- Pain		Wilcoxon test, descriptive statistics.	statistical difference between intervention groups. Mean anxiety levels also decreased significantly between baseline and post-intervention in group one ($p < 0.05$) Anxiety levels increased in the control group on postoperative day two after bed rest ($p<0.05$); however, anxiety levels in both intervention groups decreased following music therapy ($p < 0.001$) Mean pain levels in the intervention groups were significantly lower than the control group ($p < 0.001$). The pain level in intervention group two was significantly lower than in intervention group one post-intervention ($p < 0.05$). Pain levels on postoperative days one and two were significantly		The intervention was non-invasive, cheap, and easily administered. Adequate sample size. Implementation of interventions precise, data and statistical analysis clear and available. **Limitations** They didn't compare types of music or the impact of patients having a choice of music vs. no choice. Authors report earlier studies have shown minimal effects of music on anxiety. **No adverse effects noted.**

						lower in both intervention groups compared to baseline ($p < 0.001$)		

APA Citation: Weingarten, S. J., Levy, A. T., & Berghella, V. (2021). The effect of music on anxiety in women undergoing cesarean delivery: a systematic review and meta-analysis. *American Journal of Obstetrics & Gynecology MFM*, *3*(5). https://doi.org/10.1016/j.ajogmf.2021.100435

Conceptual Framework or Model	***Design or Method***	***Sample & Setting***	***Major Variables Studied & their Definitions, if any***	***Outcome Measurement(s)***	***Data Analysis***	***Findings***	***Level of Evidence***	***Quality of Evidence: Critical Worth to Practice***
N/A	Systematic Review and Meta-Analysis	15 RCTs containing 1,361 patients performed between 2010 and 2020 comparing music intervention with no music controls for women undergoing cesarean delivery. Studies needed to measure preoperative, intraoperative, or postoperative anxiety with a visual analog scale, State-Trait Anxiety Inventory, or Zung Self-Rating Anxiety Scale. Non-controlled trials, case studies, or quasi-experimental study designs, review articles, use of additional interventions, intervention performed after leaving the PACU, use of a non-	IV- Music DV1- Anxiety DV2- Pain	**Primary outcome-** Intraoperative anxiety during cesarean. **Secondary outcomes include preoperative and postoperative anxiety, pain, opioid requirements, blood pressure, and heart rate.**	Descriptive statistics, Chi-square, t-test, Begg and Egger tests	Lower intraoperative visual analog scores (VAS) for anxiety (mean difference, -0.54; 95% confidence interval, -0.87 to -0.20; n=2 studies) Lower State-Trait Inventory score (mean difference, -2.80; 95% confidence interval, -4.57 to -1.03; n=1 study) Lower Zung Self-Rating Anxiety score (mean difference -4.80; 95% confidence interval, -7.08 to -2.52; n=1 study) Music is associated with decreased anxiety scores regardless of whether the cesarean section was scheduled or unscheduled. Music effectively decreases intraoperative anxiety during cesarean delivery regardless of whether the patient or researchers chose the theme. The effect of pre and postoperative anxiety varied depending on	I	**Quality of Evidence** **A** **Strengths** Large meta-analysis, thorough literature review, and detailed data analysis. Objective measures. **Limitations** Different anxiety tools were used between studies. Publication bias was not assessed, some heterogeneity for duration and type of music as well as the timing of anxiety assessment.

		eligible anxiety assessment tool, and redundant data were excluded.				which scale was used to measure anxiety. Music significantly decreased opioid use postoperatively (mean difference, -0.87; 95% confidence interval, -1.55 to -0.19)		

APA Citation: Wong, L. M., Muhammad, M., & Liu, C. Y. (2021). Anxiety before elective caesarean section, can music mellow expecting mothers? *Medicine & Health (Universiti Kebangsaan Malaysia), 16*, 69.								
Conceptual Framework or Model	***Design or Method***	***Sample & Setting***	***Major Variables Studied & their Definitions, if any***	***Outcome Measurement(s)***	***Data Analysis***	***Findings***	***Level of Evidence***	***Quality of Evidence: Critical Worth to Practice***
N/A	RCT	40 Patients undergoing cesarean section delivery of full-term pregnancy in Malaysia. Exclusions unavailable	IV- Anxiety DV- Instrumental jazz music 30 minutes before cesarean.	Amsterdam Preoperative Anxiety and Information Scale (APAIS)	Unavailable	Lower mean Amsterdam Preoperative Anxiety and Information Scale (APAIS) score (16.0 ± 4.7 vs. 22.3 ± 5.4, $p < 0.001$) There is no statistical difference in heart rate or blood pressure.	I	**Quality of Evidence** **C** **Strengths** N/A **Limitations** Abstract only available.

Appendix E

Post-Implementation Survey

1. In your opinion, was classical music helpful in decreasing patient anxiety? Yes or No
2. Regarding using music for anxiolysis, what went well?
3. Regarding using music for anxiolysis, what did not go well?
4. Regarding the piloting process, what suggestions do you have for improvement?