UNIVERSITY OF CALIFORNIA,
IRVINE

# Anxiety among Adults Undergoing Elective Lumbar Spine Surgery at University of California – San Diego Medical Center – La Jolla

DNP Scholarly Project Paper

submitted in partial satisfaction of the requirements
for the degree of

DOCTOR OF NURSING PRACTICE

in Nursing Science

by

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**DEDICATION**

First and foremost,

I would like to dedicate this work to Rita Thrasher, a woman who is nothing short of a natural force. Her perseverance in the face of hardship and resistance is my definition of passion. Her love for her community and for impacting any positive change, big or small, is my definition of advocacy. Her effortless ability to simultaneously stand in strength, in grace, and in humor is my definition of a woman.

Rita, you made me believe that the fight is worthwhile.

Second,

I want to dedicate this to my beautiful support system. Mom, dad, and Alice, you are my soulmates. Luis and Weston, you held me up every day; you both contain multitudes.

***

I draw from the Absurd three consequences: my revolt, my liberty, my passion.

-Albert Camus

Да би мирно стояло, не би чудо видяло.

-Bulgarian Proverb

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**ABSTRACT OF THE DNP SCHOLARLY PROJECT PAPER**

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by

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University of California, Irvine, 2022

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Lumbar spine disease accounts for half of all musculoskeletal complaints and is a major contributor to pain and disability. Surgical intervention is often used as the ultimate management modality among patients with complicated spine conditions. Evidence documents a high prevalence of anxiety among patients with this disease process, and patients with anxiety who receive surgical treatment for low back pathology demonstrate worse postoperative outcomes, including more severe pain, higher rates of postoperative delirium, and increased length of hospital stay when compared to those without anxiety. Despite these known disparities, University of California, San Diego – La Jolla (UCSD – La Jolla) does not screen elective lumbar spine surgical patients for anxiety in the postoperative setting, a time when pain and disability are at their most severe. In response, this project introduced anxiety screening among this patient population using the Anxiety domain of the Hospital Anxiety and Depression Scale (HADS-A) on postoperative day one. Those patients who screened positive for anxiety were referred for osteopathic manipulative treatment (OMT), a therapy which has been shown to effectively ameliorate postoperative pain among lumbar spine patients and postoperative anxiety. This project had three outcome measures: (1) participation rate, or the percentage of patients who accepted the screening protocol, (2) anxiety prevalence, or the percentage of patients who screened positive for anxiety on the HADS-A, and (3) OMT consult rate, or the percentage of patients who received OMT prior to

discharge. We screened 20 patients over a period of two weeks. We observed a participation rate of 100%, as well as an OMT consult rate of 100%. Among the 20 patients screened, 35% screened positive for anxiety, and an additional 10% screened as borderline abnormal (or having some evidence of anxiety). When considering individual items on the HADS-A, we found that the item with the highest average score was the one that asked after somatic symptoms, which reinforces the role pain plays postoperatively among this patient population. While we cannot extrapolate the results observed in this project due to the limited sample size, the suggestion that a third of postoperative lumbar spine patients may experience anxiety should act as an impetus for ongoing screening.

## CHAPTER 1: INTRODUCTION

### Anxiety among Adults Undergoing Elective Lumbar Spine Surgery at University of California – San Diego Medical Center – La Jolla

### Background/Significance

Lumbar spine disorders account for 50% of all chronic musculoskeletal disease and affect 70% of the population in developed countries (Netto et al., 2017). Individuals who are not responsive to conservative therapy often opt for surgical interventions to alleviate or prevent an exacerbation of spine disease-related symptoms. These symptoms include low back pain, lower extremity pain or weakness, a decrease in lower extremity sensation, and at times bowel and bladder dysfunction. Aside from somatic symptoms, patients with chronic low back pain are more likely to experience psychiatric disorders (Mok & Lee, 2008). According to Jackson et al., (2020), up to 59% of patients who present to outpatient spine clinics have concurrent symptoms of an active mental health disturbance, including anxiety. Some studies suggest that anxiety precedes chronic back pain (Polatin et al., 1993); others have found that pain-related anxiety predicts the prevalence of depression among patients with lower back disease (McCracken & Gross, 1998). However, the general consensus is that there is a strong association between depression, anxiety and low back pain, and that this relationship is bidirectional and cumulative (Coronado et al., 2015; Costelloe et al., 2020; Fernandez et al., 2017), whereby psychiatric disturbances worsen pain symptoms, and the presence of chronic, severe pain further exacerbates psychiatric disturbances.

Even though lumbar spine operations have been shown to lead to an overall improvement of functional outcomes in patients whose symptoms were refractory to other treatment modalities, up to 40% of patients continue to suffer from chronic pain and pain-related disability postoperatively (Coronado et al., 2015). In this postsurgical setting, too, the relationship between low back pain and anxiety exists, and patients experiencing anxiety have demonstrated worse postoperative outcomes, including more severe pain, higher rates of postoperative delirium, higher rates of hospital readmission, increased length of hospital stay and nonroutine hospital discharges (Jackson et al., 2020).

University of California Medical Center's (UCSD) orthopedic spine program is expansive, with spine procedures being performed by two service lines, orthopedic spine and neurosurgery. The orthopedic spine service employs four surgeons who specialize in spine procedures, while the neurosurgical service employs nine (*"*Orthopedic spine care", n.d.). Elective spine surgeries are primarily performed at UCSD's La Jolla campus (UCSD – La Jolla). Both service lines treat identical disorders (e.g., vertebral fractures, kyphosis, spondylolisthesis) and perform the same surgical procedures to treat these disorders (e.g., laminectomies, fusions, decompressions). Despite the focus on innovative and progressive practices and the high volume of back disease patients that are treated at UCSD – La Jolla, there is no special consideration of the mental health of patients in the postoperative periods.

In the increasing interest for patient-specific care, it is important to consider how patient factors – not just physical, but also psychosocial – can impact patients as they interact with the healthcare system (McGirt et al., 2017). Specifically, it is crucial that providers evaluate for the presence of anxiety among this patient population so that they may incorporate individualized interventions into patients' plans of care and, in turn, prevent the disparities in postoperative recovery among those patients who suffer from anxiety.

A modality that has been shown to be effective in relieving both anxiety and pain among both chronic pain patients and postoperative patients is osteopathic manipulative treatment (OMT). According to Edwards & Toutt (2018), patients with chronic pain who underwent osteopathic treatment experienced an increase in self-care and a significant reduction in pain, anxiety, and mental health disorders. Among postoperative patients, Pomykala et al. (2008) found that those patients who had received OMT after surgery self-reported using fewer pain medications (43%), endorsed a reduction in their pain (74%), said OMT had reduced their anxiety (90%), and stated an improvement in their overall comfort level (98%). Lastly, Kim et al. (2014) performed a study to evaluate the effectiveness of an OMT intervention specifically among postoperative low back surgery patients and found that those who received osteopathic treatment experienced an improvement of postsurgical physical disability by 54%, decreased residual leg pain by 53%, and decreased postoperative low back pain by 37%. While Kim et al. (2014) did not

specifically study the impact of OMT on postoperative anxiety among low back patients, the established bidirectional relationship between postoperative pain and anxiety, as well as the benefit of OMT on anxiety among the general postoperative population, suggests that OMT may also play a beneficial role in alleviating anxiety symptoms in postsurgical low back patients.

### Problem Statement

Despite evidence that the presence of anxiety is a risk factor for poorer postoperative outcomes among spine patients, there is no standardized practice at UCSD – La Jolla to perform anxiety screening for patients who have undergone elective lumbar spine operations, and there is no individualized treatment in place for patients with anxiety postoperatively.

### Purpose

The purpose of this project is two-fold. Primarily, it is to (a) introduce postoperative state anxiety screening among adult patients who have undergone elective lumbar spine surgery at UCSD – La Jolla and (b) observe the prevalence of postoperative state anxiety among this patient population. Secondarily, it is to refer those patients who screen positive to inpatient osteopathic medicine and assess whether osteopathic manipulative treatment (OMT) is a reliable intervention for UCSD– La Jolla's elective lumbar spine patients.

### PICOT

For adult patients who have undergone elective lumbar spine surgery at UCSD – La Jolla, how prevalent is postoperative state anxiety, and is osteopathic manipulative treatment a reliable intervention for the management of postoperative state anxiety among our patient population?

## CHAPTER 2: Body of Evidence

### Literature Review Approach

A literature review was conducted to help determine the extent of anxiety's influence among postoperative lumbar spine patients by considering postoperative outcomes among those with and without anxiety. Because of the well-established coexistence of depression and anxiety among chronic back

patients, most of the literature did not study depression and anxiety individually, but instead used both depression and anxiety concurrently to represent mental health disturbances. Subsequently, this literature review considered both.

For the purposes of this study, lumbar spine surgery is defined as lumbar laminectomy, lumbar discectomy, lumbar fusion, and lumbar decompression. Elective surgery is defined as non-emergent, uncomplicated, and intended for the improvement of chronic pain, lower extremity sensory loss or weakness in patients suffering from lumbar radiculopathy or spondylolisthesis. As a result, literature discussing lumbar spine surgery indicated for traumatic lumbar injury, fractures and lumbar spine tumors was excluded because of the relative severity in patient presentation, the implicit stress associated with the event and diagnosis, as well as the greater complexity of the surgical procedure and more complicated postoperative recovery.

## Search Process/ Results

Applicable search terms that correspond to the inclusion and exclusion criteria were entered into two databases, PubMed and CINAHL. A preliminary search on PsychInfo demonstrated literature already discovered via PubMed and CINAHL; therefore, PsychInfo was not officially used as a database. Only studies published in the last 10 years were included.

PubMed search terms were as follows: "Lumbar Vertebrae/surgery"[Mesh]" OR "lumbar" AND "spinal" OR "spine" AND "surger*" AND "Elective Surgical Procedures"[Mesh] OR "elective" AND "Anxiety"[Mesh:NoExp] OR "Catastrophization"[Mesh] OR "Pain, Postoperative" [Mesh:NoExp] OR "Depression" [Mesh] OR "Depressive Disorder"[Mesh:NoExp] OR "Depressive Disorder, Major"[Mesh] OR "Depressive Disorder, Treatment-Resistant" [Mesh] OR "Dysthymic Disorder"[Mesh] OR "Seasonal Affective Disorder"[Mesh] OR "pain" AND "catastrophization" OR "catastrophisation" OR "anixiet*" OR "anxious" OR "depression" OR "depressed". Complete search terms are listed in *Appendix C.*

Initial search from PubMed returned 70 articles, while CINAHL returned 24 results. Twenty-three of the 24 CINAHL articles were duplicates of the PubMed search. Following removal of these duplicate articles, the reports assessed for eligibility amounted to 71. Of these 71, 58 were excluded from final review: Twenty-three were excluded for discussing postoperative pharmacological management only, 18 were excluded for not addressing mental health disturbances, 4 for testing mental health intervention effectiveness rather than discussing the impact of mental health disturbances, 3 for discussing specific intraoperative surgical techniques, 3 because they specifically discussed the influence of obesity, 2 because they did not discuss spinal surgery, another 2 for relating to opioid use only, 1 for addressing the impact of diabetes specifically, 1 for studying infants, and 1 for studying non-human subjects. Ultimately, thirteen articles comprised this literature review. See *Appendix D* for PRISMA chart.

## Appraisal of Evidence

Of the thirteen publications, 7 utilized a retrospective study design (Amaral et al., 2017; Elsamadicy et al., 2020; Floyd et al., 2015; Jain et al., 2019; Jimenez-Almonte et al., 2020; ; Mezzacappa et al., 2020; Sayadipour et al., 2016), 5 were prospective, longitudinal studies (Falavigna et al., 2015; Hart et al., 2013; McGirt et al., 2017; Tharin et al., 2012; Wagner et al., 2020), and 1 utilized focus group interviews and qualitative content analysis (Angelini et al., 2018). Two of the papers were only published as abstracts (Elsamadicy et al., 2018 & Tharin et al., 2012).

All seven retrospective studies performed multivariate analyses of data gathered from databases to ascertain correlations between patient factors and post-surgical outcomes. Five of the seven (Amaral et al., 2017; Floyd et al., 2015; Jimenez-Almonte et al., 2020; Mezzacappa et al., 2020; Sayadipour et al., 2016) evaluated patient data from medical records at single institutions. Two, Elsamadicy et al. (2020) and Jain et al. (2019), utilized a national and state database, respectively. Two (Amaral et al., 2017 & Jimenez-Almonte et al., 2020) determined patient data at least partly via results from patient self-report screening tests (i.e., screens for disability and quality of life) but only one (Amaral et al., 2017) utilized self-reported mental health screening tools specifically. The remaining studies relied on history and

diagnostic codes from patient charts to ascertain relevant patient factors and comorbidities. Relevant post-surgical outcomes studied included length of stay, rate of readmission, and opioid use following discharge.

All five of the prospective, longitudinal studies relied on patient self-reported data reported via validated screening tools. Data collection spanned 12 months for each. Falavigna et al. (2015), McGirt et al., (2017), Tharin et al. (2012), and Wagner et al. (2020) analyzed the relationship between mental health disorders and postoperative outcomes by correlating self-reported measures of depression/ anxiety and self-reported indicators of specific postsurgical outcomes (i.e., quality of life and disability). Hart et al. (2013), alternatively, evaluated the relationship between depression (determined as a diagnosis listed on the patients' medical records) and postoperative PTSD, which was evaluated via a self-reported screening tool.

The qualitative study (Angelini et al., 2018) performed focus group interviews to study patient experiences following an elective lumbar spine surgery.

The articles were evaluated using the Johns Hopkins Nursing Evidence-Based Practice's Evidence Level and Quality Guide (Dang & Dearholt, 2018). This evaluation tool grades literature based on Evidence Levels (I-V), depending on study design, and Quality (Grades A-C), whereby A is high quality, B is good quality, and C is low quality. *See Appendix F.*

The two abstracts (Elsamadicy et al., 2018 & Tharin et al., 2012) could not be sufficiently evaluated due to insufficient description of methodology in the publications. The literature review did not consist of any true randomized control trials with intervention, so none of the thirteen articles were graded as an Evidence Level I.

Five of the thirteen (Amaral et al., 2015; Falavigna et al., 2015; Floyd et al., 2015; Jain et al., 2019; Sayadipour et al., 2015) were evaluated as an Evidence Level II due to their use of non-randomized comparison groups. For instance, Jain et al. (2019) compared demographic characteristics and history of

depression/anxiety between patients who had readmitted within thirty days and those who had not, while Floyd et al., (2015) compared length of stay among four groups categorized based on presence of anxiety, or not, and use of anxiolytics, or not.

One of these five studies, Jain et al. (2019), was afforded a Quality grade A based on its large, heterogenous sample size (multicenter, derivation cohort of 92,262 participants and a validation cohort of 90,257 participants) and rigorous statistical evaluation of patient demographic variables, which allows the study to correct for possible confounding characteristics. The study is considered a high level of quality due to its comprehensive literature review, the high predictive value of its results as evidenced by a strong statistical significance ($p < 0.001$), and its thorough consideration of the possible application of its findings to clinical practice. Jain et al.'s (2019) design limitation is that the presence of mental health disorders was obtained via diagnostic codes rather than rigorous screening, but as this is a common component of retrospective designs, it was not deemed sufficient cause to reduce the quality grade of the study.

Amaral et al. (2017) and Falavigna et al. (2015) were given a quality grade of B as both are limited by a small sample size for the study design ($n = 136$ and $n = 91$, respectively) compounded with a large number of demographic variables considered, which limits the studies' statistical power and, in turn, their ability to arrive at consistent, definitive conclusions.

Floyd et al., (2015) and Sayadipour et al., (2015) were evaluated as a Level of Evidence IIC due to the small number of participants in each comparison group *(n*=307 divided over four comparison groups and *n*=142 divided over two, respectively) and the failure on part of the authors to define the presence of mental health disturbances among cohort groups using reliable means. Specifically, Floyd et al. (2015) assumed that use of anxiolytics implied controlled anxiety without considering length or indication for use. Similarly, Sayadipour et al. (2015) established the presence of depression based on the use of antidepressants at the time of surgery alone. Both antidepressants and anxiolytics are commonly used for pain control among patients with spine disease (Salerno et al., 2002). As such, any associations

found between the studies' dependent variables (length of stay and cost of hospitalization) and antidepressant or anxiolytic use cannot be attributed to the presence or absence of mental health disorders alone.

The remaining six studies (Angelini et al., 2018; Hart et al., 2013; Jimenez-Almonte et al., 2020; Mezzacapa et al., 2020; McGirt et al., 2017 & Wagner et al., 2019) that made up the literature review were categorized as Evidence Level III due to their observational design without use of comparison groups.

Two (Jimenez-Almonte et al., 2020; McGirt et al., 2017) were designated as a Quality Level A. Both studies included a sufficient sample size ($n$= 435 and $n$=7,618, respectively) with thorough consideration of and control for patient demographics, thereby limiting the presence of confounding. Both studies also demonstrated rigorous determination of dependent variables (i.e., pain, disability, and quality of life) via screening tools rather than diagnostic codes. This is important to note especially of Jimenez-Almonte et al. (2020) given its retrospective design. Moreover, both demonstrated consistent results, with Jimenez-Almonte et al. (2020) finding a statistically significant relationship ($p$=0.02) between mood disorders and Visual Acuity Scale (VAS) pain scores and McGirt et al. (2017) concluding a statistically significant improvement of patient pain, disability, and quality of life at twelve months after surgery ($p <$ 0.0001). Along with the stronger statistical power of its results, McGirt et al. (2017) is likely to be more generalizable due to its multicenter design and sample size of $n$=7,618 when compared to Jimenez-Almonte et al.'s (2020) single center design and sample size of $n$=435. McGirt et al.'s (2017) participant retention rate is 71.2% but the authors do not justify this phenomenon or describe the demographic characteristics of the patients who were enrolled but did not participate. As a result, it is difficult to determine the significance of this retention percentage. McGirt et al. (2017) includes a thorough discussion of practice implications whereas Jimenez-Almonte et al. (2020) does not offer recommendations for future practice.

Three studies (Angelini et al., 2018; Hart et al., 2013; Wagner et al., 2019) received a quality grade IIIB. Angelini et al (2018), the only qualitative design, is limited by its small sample size ($n$=12) and its single center design. It is strengthened by its use of semi-structured interviews and ability to identify consistent themes. They offer extensive discussion of their findings as they relate to clinical practice and offer specific recommendations. Hart et al. (2013) and Wagner et al. (2019) are both limited by their sample size ($n$=73 and $n$=180, respectively). While Hart et al. (2013) accounts for a wide variety of patient baseline variables, including many intraoperative and postoperative variables which could have affected the dependent variable (post-traumatic stress disorder), its small sample size is not substantial enough to demonstrate statistically significant, generalizable patterns while accounting for possible confounders. Wagner et al. (2019) similarly considers a wide array of demographic variables but presents a convenience sample that is too small to provide generalizable, reliable findings. Both studies are strengthened by their rigorous determination of independent variables through screening tools rather than EMR diagnostic codes.

Mezzacapa et al. (2020) was deemed a quality grade C due to the inadequate operational definition of its dependent variable, narcotic use, which was determined dichotomously based on whether narcotics were prescribed rather than the extent to which they were used by patients postoperatively. This suggests that any outcome reported was purely representative of associations with prescriptions written rather than actual symptoms of pain. As such, the measured outcome is not directly reflective of the intended outcome, thereby limiting the study's ability to draw valid conclusions. Moreover, the study's population consists solely of veterans. Because sampling was randomized (the first 25 patients from each calendar year over a 16-year period were selected), the study's results are likely generalizable to veterans but may not be applicable to the general population. Lastly, while the study's sample size ($n$=376) was sufficiently large for its design, patient demographics were obtained via chart review rather than through validated screening tools.

## Comprehensive Synthesis of Evidence

According to 10 of the 13 studies (Amaral et al., 2017; Angelini et al., 2018; Elsamadicy et al., 2018; Falavigna et al., 2015; Hart et al., 2013; Jain et al., 2019; Jimenez-Almonte at al., 2020; Mezzacappa et al., 2020; McGirt et al., 2017; Wagner et al. 2020)., patients with mental health disturbances were shown to have worse postoperative outcomes when compared to patients without psychological disorders. Angelini et al. (2018) established that the incidence of postoperative anxiety was significant. Amaral et al. (2017), Hart et al., (2013), McGirt et al. (2017) and Wagner et al. (2020) all found a significant correlation between psychiatric conditions and disability. Amaral et al. (2017) and Wagner et al. (2020) further found an association between psychiatric conditions and reduced overall quality of life. Notably, the studies by these two authors demonstrated that the disparities between patients with and without mental health disturbances were more prominent in the early postoperative stages and became almost indistinguishable between the two groups at 12 months following surgery. In a similar vein, Falavigna et al. (2015) found that postoperative psychiatric conditions were more predictive of poor postoperative quality of life and disability than preoperative psychiatric conditions did. Jimenez-Almonte et al. (2020), interestingly, did not find a significant correlation between mental health disturbances and disability, but did find a significant relationship between depression/anxiety and pain, while Mezzacappa et al. (2020) established an association between psychiatric conditions and opioid use. Lastly, Jain et al. (2019) found that mental health disturbances were predictive of readmission, but that this was more prevalent among patients with depression. Conversely, one study found that patients with and without depression and/or anxiety both reported improvement in depression, anxiety, pain, and disability at one year postoperatively (Tharin et al., 2012) without clarifying the impact of the early postoperative period. Finally, two found no statistically significant correlation between the presence of mental health disturbances and increased length of stay (Floyd et el., 2015 & Sayadipour et al., 2015).

In sum, 10 of the 13 studies demonstrated the deleterious impact of mental health disturbances on postoperative outcomes among postoperative lumbar spine patients, 1 found an overall improvement of

patients' mental health status postoperatively, and 2 found no evidence of the influence of mental health disturbances on length of hospital stay.

The literature was found to have two major gaps. First, most studies did not specifically differentiate anxiety as a separate mental health condition. Instead, anxiety and depression were clustered together under the purview of psychiatric conditions and, as such, were used to more generally demonstrate the impact of psychiatric conditions on postoperative patient outcomes. While, as previously discussed, anxiety and depression were often concurrently found among this patient population and have been shown to potentially inform each other, the two ought to be considered individually. This is true mainly because future clinical studies ought to evaluate treatment of mental health disorders and the impacts of these treatments on patient well-being and postoperative recovery. Of course, anxiety and depression are likely to be treated differently and be individually responsive to management modalities.

The second gap in the literature is that very few studies considered the immediate postoperative period despite the aforementioned evidence that disparities are more notable during this time. Firstly, the earliest screening for postoperative mental health disorders in the literature is done by Jimenez-Almonte et al. (2020) at two weeks postoperatively. Second, postsurgical patient outcomes (i.e., pain, disability, quality of life) are mainly considered after discharge. The only exceptions to this are Mezzacapa et al. (2020), who studied opioid use in the postoperative period, and Floyd et al. (2015) and Sayadipour et al. (2015) who measured length of stay as dependent variables. The earliest dependent variable reevaluation among the rest is done at 30 days by Elsamadicy et al. (2018) and looks at readmission rates; however, this isn't a strictly patient-related outcome.

The importance of elucidating the longitudinal impact of anxiety and depression on elective spine surgery patients is, of course, indubitable since it helps inform the long-term risk versus benefit of patients undergoing these surgical procedures. But with more than half of the studies demonstrating that psychological disturbances negatively impact patient recovery, it is incumbent on the providers of elective

spine procedures to also examine the impact of these on the immediately postoperative period, where recovery first begins.

### Evidence-Based Recommendation for the Project

This project's literature review, indeed, found evidence that the presence of mental health disturbances, including anxiety, were correlated with worse postoperative outcomes. Despite the limited evidence about immediately postoperative outcomes, the literature review did demonstrate that, overall, mental health disorders were either more prevalent in the postoperative setting, or that postoperative depression/anxiety were more likely to contribute to worse postoperative outcomes. Indeed, a number of studies (Amaral et al., 2017; Angelini et al., 2018; Hart et al., 2013; Mezzacapa et al., 2020) explicitly recommended the introduction of mental health screening among the lumbar spine postoperative population. Hart et al. (2013) additionally expresses the importance of both screening and of appropriate intervention among patients who do screen positive for mental health disturbances in the postoperative setting. As a result, this project aims to introduce anxiety screening in the immediate postoperative period specifically at UCSD – La Jolla and intervene using osteopathic manipulative treatment (OMT).

## CHAPTER 3: PROJECT FRAMEWORK

### Conceptual Framework

The Neuman Systems Model (*Appendix F*) was used as the guiding theoretical framework for this project. The Neuman Systems Model is built around the idea of describing patients as comprehensive systems that are comprised of several simultaneously operating innate features. These innate features are based around physiological, psychological, sociocultural, developmental, and spiritual factors (Hannodee & Dhamoon, 2021). According to the Systems Model, all these dynamic components are guarded via protective "defense lines" that safeguard the system as it interacts with the external environment. These defense lines are protective against stressors and, in their intact state, represent a person's state of equilibrium and wellbeing. Resilience, both psychological and physiological, serves to maintain the

integrity of defense lines. Inversely, stressors may overwhelm defense lines and infiltrate the human system, thereby putting its wellbeing at risk (Hannoodee & Dhamoon, 2021).

Degenerative spine conditions and the associated pain and disability threaten patients' physiological and psychological well-being, as well as their social positions. The disease may itself lead individuals to suffer from mental health abnormalities, including anxiety, or may exacerbate existing anxiety (Coronado et al., 2015; Costelloe et al., 2020). When evaluated from the lens of the Neuman Systems Model, then, spine disease serves as a threat to an individual's lines of defense. This project specifically conjectures that patients with refractory spine disease who are referred for surgical intervention are the most susceptible to infiltration of normal defense because their symptoms are, by definition, the most long-standing and severe. Moreover, the project supposes that surgical intervention itself represents the absolute peak state of all stressors due to the acute, severe postoperative pain and the impaired sense of autonomy that predictably accompanies hospitalization. As such, individuals' basic structure ought to be the most threatened in the immediate postoperative state. In the figure *(Appendix F*), this is represented via the red lines penetrating through the lines of defense and resistance. As discussed above, despite the vulnerability patients face in this immediate postoperative stage, the existing literature largely fails to consider patient outcomes during this period.

In applying the Neuman Systems Framework to postoperative lumbar spine patients, the project considered hospitalization and anxiety as potential stressors that threatened patients' well-being, or "basic structure". Hospitalization is, of course, a given among patients who have been hospitalized after a lumbar spine procedure. Anxiety, then, was analyzed using self-reported anxiety score on the Hospital Depression & Anxiety Scale: Anxiety Domain (HADS-A). A high score on this tool was assumed to signify the intensity of the Neuman Systems Theory's "degree of reaction", as illustrated in *Figure 3*, and in turn, reflective of the extent to which the "basic structure" is threatened.

To summarize, in portraying the individual as a system whose well-being may be overwhelmed by an influx of stressors which penetrate means of defense, the Neuman Systems Model emphasizes the

importance of considering the state of patients at the peak influx of stressors because this is when their basic structure is most threatened. We believe this peak influx occurs in the period immediately after hospital admission as a result of the distress induced by acute surgical pain and loss of autonomy in the immediate postoperative setting.

**Logic Model**

The Logic Model (see *Appendix G*) portrays a process flow diagram that briefly summarizes the inputs, throughputs, outputs, and overall outcome goals of the project and illustrates those in a succinct graphical format.

In evaluating the role of anxiety symptoms on postoperative outcomes, our inputs consisted of the actors involved (the project lead, neurosurgeons, orthopedic spine surgeons, physicians' assistants and osteopathic medicine doctors), the settings where the project took place (inpatient units 5H & 3W), and the anxiety screening tool (HADS-A). The activities, or throughput, were the tasks that the project actors engaged in, including state anxiety screening and referral to osteopathic manipulative treatment for those patients who screened positive. The output was the data collected, as well as the themes discovered through data analysis. More specifically, the output was the percentage of patients who screened positive for state anxiety in the postoperative setting, as well as the percentage of patients who were referred for OMT and underwent treatment prior to discharge.

The short-term goal of this project was to introduce screening for anxiety in the immediate postoperative setting among patients who have undergone elective lumbosacral spine surgery at UCSD – La Jolla. It was also to refer those patients who screen positive for state anxiety to osteopathic manipulative treatment. Following data analysis, the intermediate plan will be to use the data gathered as grounds to introduce ongoing postoperative screening in this patient population. At this stage, the plan would also be to evaluate the impact of OMT on postoperative state anxiety by performing screening both prior to and following intervention in a future study.

Ultimately, the hope is that patients with postoperative anxiety, through receiving individualized treatment, demonstrate postoperative outcomes that are similar to those without postoperative anxiety. In reference to the Neuman Systems Model above, the institution of these measures would help to postoperatively buffer lines of defense, as shown by the green line and circle in *Figure 3* and diminish the infiltrative potential of the added stressors associated with surgical intervention. If in the intermediate setting, there is evidence that OMT does, in fact, impart a benefit on postoperative anxiety, a large scale research study that considers the correlation between specific postoperative outcomes, the presence of anxiety, and the inclusion of an OMT intervention would be valuable.

## CHAPTER 4: METHODS

### Project Goals

This project aimed to implement anxiety screening and OMT referral in the immediate postoperative period as is supported in the literature. We focused specifically on anxiety and screened patients for state anxiety using the HADS-A on post-operative day one (POD 1). For those who screened positive, we intervened by referring the patient to inpatient osteopathic manipulative treatment (OMT). We evaluated the plausible reliability of this intervention as a means to alleviate anxiety among elective lumbar spine patients at UCSD – La Jolla by measuring the percentage of patients who were, in fact, seen by osteopathic medicine and received osteopathic manipulative treatment (OMT) prior to discharge.

### Project Description

#### Project Type/Design

This project is an evidence-based practice project which identifies clinical practice gaps, evaluates the literature, builds methods around existing recommendations in the current body of knowledge, and applies those to clinical practice.

#### Project Setting/Population

UCSD — La Jolla's elective lumbar spine patients are residents of larger San Diego County and are normally over the age of 65 and retired. San Diego county's population is 42.6% White (Non-

Hispanic), 22.8% White (Hispanic), 16.8% Asian, 5.82% African American ("San Diego County", n.d.). UCSD is a not-for-profit medical center and, as such, accepts patients with private insurance, Medicare and Medicaid. Because these procedures are elective and non-emergent, uninsured patients rarely qualify.

The two units at UCSD-La Jolla to which elective lumbar spine patients are admitted postoperatively are 5H in the Jacobs Medical Center tower and 3 West (3W) at the Thornton Medical Center tower. 5H is a twelve-bed neurology/ neuro-oncology progressive care unit. The patient to nurse staffing ratios is 3:1. All patient rooms are private.

3W is a twenty-seven bed orthopedic unit. It houses medical-surgical, telemetry, and intermediate levels of care patients. Staffing ratios are dependent on the acuity of patients. Medical-surgical patients may be staffed 5:1 (5 patients to 1 nurse), telemetry patients 4:1, and intermediate level of care patients 3:1. There are nineteen private rooms and four shared, each with two patient beds.

**Participants/ Recruitment**

The participants of this project were adults >18 years of age who were patients of orthopedic spine and neurosurgery at University of San Diego – La Jolla and had undergone an elective lumbar spine procedure followed by an inpatient admission. The indications for spine surgery included lumbosacral stenosis, spondylosis, and degenerative disc disease that has been unresponsive to conservative measures. Participants were selected through convenience sampling, whereby all eligible admitted postoperative patients were asked to participate.

Exclusion criteria for participation included individuals <18 years of age and those whose surgical indications included trauma or resection of a known tumor. Spinal procedures for trauma or tumor removal, though often elective, are more complicated in their nature which is likely to have made for a more challenging recovery; moreover, the nature of a traumatic event or a tumor diagnosis is likely to impact patients' mental health differently than progressive spine disease. Surgical procedures to manage postoperative complications, such as incision & drainage for postoperative abscess formations,

were also excluded as they are not true spine operations. Lastly, same day procedure patients who were not admitted following surgeries were excluded.

Participants were recruited by the project lead. Eligible participants were determined based on the operating room schedule. The project lead approached each patient on postoperative day one, informed them that they would be screened as part of a project, that participation was voluntary, and that data gathered would not be included in their medical records. See *Appendix I* for Recruitment Materials.

**Stakeholders/Barriers**

Stakeholders included the neurosurgical and orthopedic spine attending physicians (Dr. Allen, Dr. Zlomislic, Dr. Taylor and Dr. Osorio) who perform elective spine surgeries at UCSD – La Jolla, the resident and physician's assistants (PAs) and nurse practitioners (NPs) who manage these patients postoperatively, the osteopathic medicine doctors who were consulted to treat patients who scored positive for postoperative state anxiety, and the patients who participated themselves.

A significant barrier we faced in initiating the project procedures was receiving approval of the project methods by UC San Diego's research committee. Obtaining the committee's approval was necessary prior to project implementation and data collection at UCSD – La Jolla. Specifically, the barrier was ensuring that the project methodology adhered to the standards set by the research committee, which differed from those set by UC Irvine (UCI). UCSD's committee found the original proposal to be consistent with research methodology as opposed to evidence-based practice and deemed it inappropriate for human research exemption. Over the span of three months, the research committee, the project lead, and project chair worked together to make several adjustments to the original methodology so that it would meet UCSD criteria for human research exemption.

One such adjustment was having a clear plan for screening Spanish-speaking patients. Despite having such a plan in place, screening in Spanish also proved to be a barrier in implementing project procedures. Because the project lead is not Spanish speaking, it was not possible for us to screen in Spanish ourselves even with a translated version of the screening tool and we, instead, relied on a secure

hospital-based translation service. Screening took approximately three times as long, and clarification was required multiple times between the project lead, the translator, and the patient.

**Description of Intervention**

This project was a 2-week pilot project which conducted postoperative anxiety screening among patients who have undergone elective lumbosacral spine surgery at University of California San Diego Medical Center – La Jolla and referred those who screened positive to osteopathic manipulative treatment (OMT).

**Instruments/ Outcome Measures**

The Hospital Anxiety & Depression Scale (HADS) is a fourteen-item self-report tool which screens for anxiety and depression separately and consists of seven items for each dimension. For the purposes of this project, only the Anxiety domain (HADS-A) was used. The scale was utilized to evaluate state anxiety and as such, participants were asked to respond based on how they felt on that day (POD 1). Each question on the HADS-A is stand-alone and asks participants to select one of four possible answers which best describes how they have been feeling. Responses are scored on a scale of 0-3 points based on either the intensity or the frequency of symptoms, whereby 0 points are afforded to the least severe/frequent response and 3 points are afforded to the most severe/frequent. A total dimension score of 0-7 represents "normal" findings (no evidence of anxiety), a score of 8-10 represents "borderline abnormal" findings, and 11-21 represents "abnormal" findings. The Hospital Anxiety and Depression Scale the HADS-A (anxiety dimension) had a sensitivity of 91% and a specificity of 63% at a cut point of 8 in patients with rheumatoid arthritis (Hitchon et al., 2020). The HADS-A had an internal consistency of 0.84 and a test-retest reliability of 0.79.

This project had three outcome measures: (1) participation rate, (2) anxiety prevalence, and (3) OMT consult rate. The second is a participant-centered measure and aims to determine the prevalence of postoperative state anxiety among the sample of elective lumbar spine patients at UCSD-La Jolla. The first and third are process-centered and aim to evaluate the effectiveness of the project intervention. The

former, participation rate, seeks to assess patient acceptance of screening protocol while the latter, consult rate, seeks to evaluate the efficaciousness of OMT referrals prior to patient discharge.

**Data Collection Procedures**

The participants' eligibility to participate in this project was determined by the project lead based on the performing surgeon and procedure name, as listed in the UCSD-La Jolla operative schedule. Once eligible patients were admitted to the hospital, the project lead visited them at bedside on postoperative day 1, briefly explained the purpose of the pilot project, and asked that they respond to the items on the Hospital Anxiety and Depression Scale - Anxiety Domain (HADS-A). The project lead verbally asked the participants each question on the screening tool along with the multiple-choice answers from which they were to choose. The lead showed the patient a print-out that listed, in large font, the multiple-choice answers for each item so that the patients could refer to it as they responded. Spanish-speaking patients were offered the screening verbally with the use of MARTI, a secure, hospital-approved translation service. Notably, a translated version of the visual aid was not available.

Once individual screening tools were completed, the project lead scored the anxiety tool immediately and requested that the primary provider place an OMT consult if the patient's HADS-A score was >11 (a value indicating a positive screen per HADS guidelines). Scores were not documented in the patients' medical record. All screening tools, including incomplete ones, were to be gathered to allow the project lead to keep track of the rate of participation. Once OMT consult was requested, the project lead applied patient label to each completed screening tool, assigned each participant a participant identification number (1, 2, 3, etc.) by writing it on the completed screen, and stored it in a secure lock box to which only the project lead had access. The lockbox was stored in the staff workroom on Unit 5H. Following the two weeks of data collection, the project lead accessed the screening tools for further outcome data collection and data recording, all of which was conducted in the Unit 5H workroom. The inclusion of the patient label on the screening tool allowed the project lead to review medical records and determine if osteopathic medicine consult was conducted for patients who scored positive, based on the

presence of an osteopathic medicine consult note prior to discharge. This data, along with HADS-A score and complete vs. incomplete survey was organized solely by the project lead into an Excel spreadsheet. No identifying patient data was included in this Excel spreadsheet and participant data was recorded under the participant identification number only. Once data was recorded, the physical copies of the screening tools were immediately disposed of in medical record shred bins on Unit 5H.

## Data Analysis

The scores of each of the seven HADS-A items was recorded individually as a continuous value between 0-3. The total HADS-A score was recorded in two ways – once as a continuous value between 0-21 and once as a categorical variable "positive" or "negative" based on whether the score was greater or less than 11, which indicates a positive or negative anxiety screen, respectively. The percentage of positive screens wase used to determine the prevalence of anxiety. The scores for each individual item on all participants' screening tools were also averaged out to demonstrate if any one item appeared to be more pervasive in this patient population.

Whether or not each approached patient participated in the screening was documented as a categorical variable ("yes" or "no"). The number of patients who participated ("yes") was divided by the number of all patients who were approached ("yes" and "no") and, as such, the participation rate is represented as a percentage point out of 100. Similarly, OMT consult rate was recorded as a categorical variable ("yes" or "no") and represented as a percentage point out of 100.

## Ethical Considerations

The official University of California, Irvine, Institutional Review Board (IRB) form, Request for -Determination-Non-Human-Subjects were completed as soon as the proposal was approved and prior to initiating the DNP project. All participants were protected by the Health Insurance Portability and Accountability Act (HIPAA) which helped maintain any identifiable patient information secure. Any participant data present on printed measures during the first round of data collection was kept in secured

containers; the physical copy was securely disposed of as soon as coding of the information is complete. Electronic data records did not include any patient-specific information.

## Sustainability/ Dissemination

This project acted largely as a pilot to screen a small sample of postoperative elective lumbar spine patients and refer those who screened positive to osteopathic medicine for manipulative treatment. The project sought to assess the prevalence of anxiety among elective spine patients at UCSD – La Jolla and whether the medical center's osteopathic medicine service can offer manipulative treatment to those patients who screen positive prior to them discharging.

Long-term sustainability of this project requires that anxiety screening using the HADS-A is introduced as a standard component of early postoperative care for all elective spine patients. This will likely require that screening be embedded into the hospital's electronic medical record (EMR).

Second, sustainability is likely to include the organization of a larger scale research study conducted primarily by the osteopathic medicine doctors and will study the impact of OMT on anxiety among UCSD's lumbar spine population. Future research ought to also evaluate the significance anxiety plays on other postoperative outcomes, including pain and mobility.

Initially, the purpose of disseminating the final data of this project was to persuade orthopedic spine and neurosurgery providers that anxiety screening among elective lumbar spine patients should be incorporated into postoperative practice. As many of these providers are stakeholders in the project, results have been relayed to them through written and verbal means of communication once final data was analyzed.

We plan to apply to present the results at the annual UCSD Nursing Quality Council meeting, where each hospital unit shares ongoing and completed quality improvement and evidence-based practice projects, as well as at UCSD's annual nursing research conference. The purpose of these presentations

will be to encourage other practitioners to reflect on the role of mental health disturbances among their respective patient populations and consider the possible benefit of self-reported screening.

Ultimately, the goal of this project is to initiate a conversation regarding the use of osteopathic manipulative treatment along with other possible interventions that may mitigate the negative impact of anxiety on patients in the postoperative setting. The marker of successful dissemination will be the widespread introduction of mental health screening and further research into possible modes of anxiety management at UCSD.

## Formative Process Evaluation

The formative evaluation was completed one week into data collection by the project lead, the UCI project chair, as well as the neurosurgery and orthopedic spine providers who are tasked with placing OMT referrals.

Our plan for participant recruitment went smoothly and without trouble. The project lead had access to the operating room schedule and was able to determine the specific procedures the four participating surgeons were performing each day. The schedule was cross-referenced the day before and day of each procedure to ensure there were no cancellations. Once verification was completed, the project lead was able to look up the patient's location on the electronic medical record. A great contributor to an uncomplicated recruitment was that the spine patients were consistently admitted to Units 5H and 3W as expected.

Patient participation was also a great success at the time of the formative evaluation in that every eligible patient who was approached agreed to participate. This is very likely to be attributable to the brevity of the screen and the ease surrounding completing the survey on the part of the patient since the project lead actively interviewed each patient.

Data collection in the first week was effective because the project lead was solely responsible for identifying, recruiting, and interviewing patients. As such, every individual who was eligible was, indeed,

recruited. Patient privacy was successfully maintained with the use of the secure lockbox to which only the project lead had access.

The biggest challenge that had to be navigated at the time of the formative evaluation was ensuring that OMT consults were ordered by the providers in a timely fashion. A large part of the reason we decided to screen patients on POD 1 specifically was to give ample time for the osteopathic medicine service to treat referred patients; consequently, a timely placement of an OMT consult order was a central component of achieving this. This potential issue was navigated by assigning one designated provider on each service line (neurosurgery and orthopedic spine) who would be directly contacted in the event of a positive anxiety screen and would be personally responsive for placing the consult order. The provider would confirm to the project lead that the referral order was placed once this task was completed. See *Appendix K* for formative evaluation questions and responses.

**Summative Process Evaluation**

A summative evaluation occurred after the completion of project implementation and data collection. This evaluation was completed by the project lead and the UCI project chair.

A large concern of this project was the ability to ultimately recruit enough participants due to the significant time limitation we faced in the data collection phase. We anticipated that there would be an estimated 5 to 10 patients a week that would be eligible for recruitment, and that only about half would agree to participate. Surprisingly, the project lead successfully recruited 20 patients in the span of two weeks and achieved an overall participation rate of 100%. Again, a large contributing factor here is believed to be the overall ease of participation. An additional factor that was noted in the summative evaluation process was the ability of the project lead to be flexible and accommodate changes in the surgical schedule or unexpected barriers to patient screening (i.e., patient being unavailable, physician rounding on patient, nurse administering medications, etc.)

A major success of the project was stakeholder engagement. Because the providers who I had recruited as stakeholders had been actively engaged in the planning process and were interested in the project topic, they were incredibly helpful during data collection and procedure implementation. Here,

too, I believe that the ease of the role I had tasked them with (placing a referral to osteopathic medicine) was helpful in allowing us to be successful.

Data collection continued to go smoothly into the second week of data collection and patient privacy was effectively maintained with the use of a secured lockbox. Once data was recorded, physical copies of screens were shredded in secure hospital-approved shred bins. See *Appendix K* for summative evaluation questions and responses.

## CHAPTER 5: RESULTS AND CONCLUSIONS

### Results

### Outcome Measure I: Participation Rate

During two weeks of data collection, twenty participants were identified as eligible based on inclusion criteria and approached to participate in anxiety screening. Of the 20 participants approached, 20 agreed to participate and were successfully screened using the HADS-A. All participants completed the entirety of the anxiety screen with none opting out following initiation of screening. This was determined by the lack of incomplete surveys stored in the secure lockbox during data recording. See *Figure 1* below.

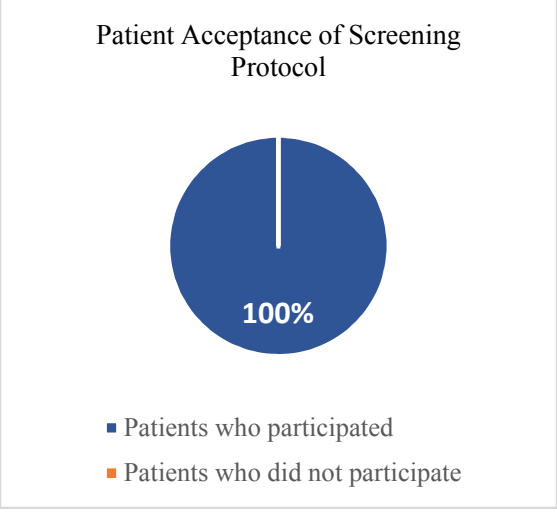


*Figure 1:* Patient Acceptance of Screening Protocol

**Outcome Measure II: Anxiety Prevalence**

The HADS-A score ranges from 0 to 21, whereby 0 signifies no self-identified symptoms of anxiety, and 21 signifies very frequent or severe self-identified symptoms of anxiety on the seven items that make up the HADS-A. See *Appendix J* for the HADS-A screen.

The lowest score recorded was a 0/21, the highest recorded was a 17/21, and the average score among the twenty participants was 8.05/21. See *Figure 2* for the GADS-A score for each participant.

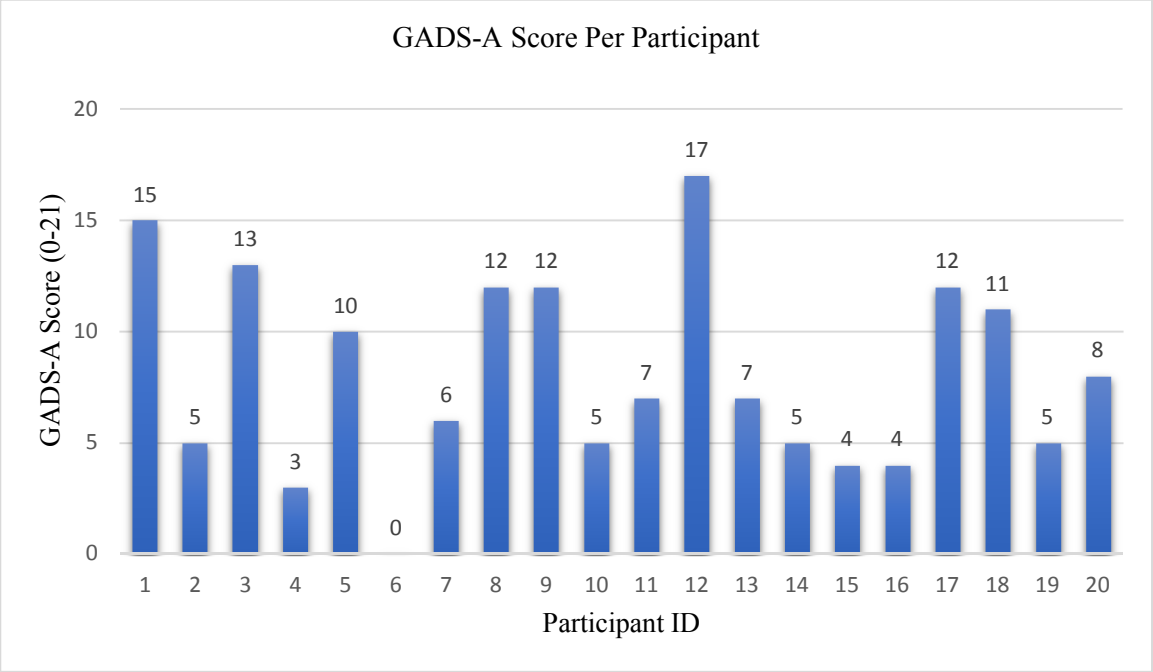


*Figure 2:* GADS-A Score per Participant

HADS-A scores are categorized into three categories based on score. A score of 0-7 is a "Normal Score" and indicative of the absence of anxiety symptoms. A score of 8-10 is a "Borderline Abnormal Score" and meant to signify someone who demonstrates some anxiety symptoms, but not severe enough to be considered abnormal. Lastly, a score of 11-21 is classified as an "Abnormal Score" and assumed to be consistent with the presence of anxiety. Of the 20 participants, 11 (55%) were determined to have a "Normal Score", 2 (10%) to have a "Borderline Abnormal Score", and 7 (35%) to have an "Abnormal Score". The 7 patients who scored within the "Abnormal Score" category were considered to screen positive for anxiety and referred to OMT. See *Figure 3*.

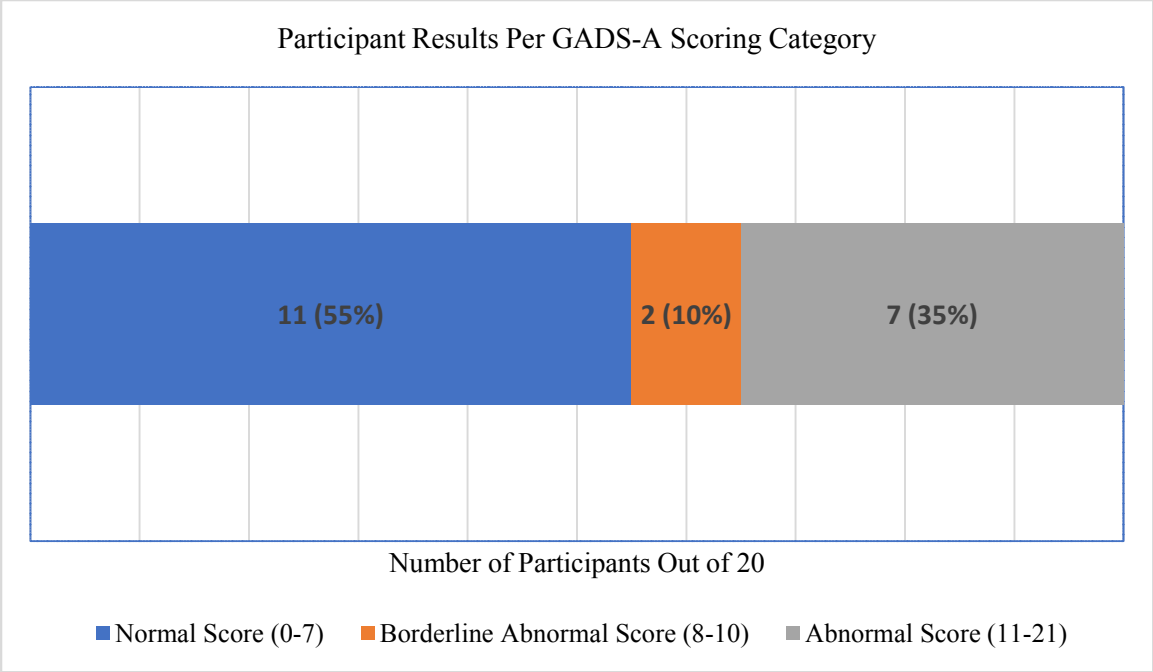


*Figure 3:* Participant Results per GADS-A Scoring Category

Each of the seven items of the HADS-A is meant to represent a different manifestation of anxiety and is scored 0-3 based on either frequency or severity of symptoms. Scores for each item were averaged among the 20 participants and illustrated in *Figure 4* below. The items with the lowest average score (0.55/3) were Items 5, "I get a sort of frightened feeling like 'butterflies in the stomach' and 7, "I get sudden feelings of panic". Item 2, "I get a sort of frightened feeling as if something awful is about to happen" also received an average score less than 1 (0.9/3). Three items received average scores between 1-2 out of 3: item 6, "I feel restless as I have to be on the move" at 1.1/3, and items 1, "I feel tense or 'wound up,'" and 3, "Worrying thoughts go through my mind," both at 1.25/3. The item that received the highest average score of 2.45/3 was item 4, "I can sit at ease and feel relaxed". This signifies that UCSD – La Jolla's elective lumbar spine population, on average, ranked their inability to feel relaxed between moderate to severe in frequency and intensity. This symptom proved nearly twice as prevalent as the average feeling of tension or sense of worry, and nearly five times more prevalent than feelings of panic or "butterflies".

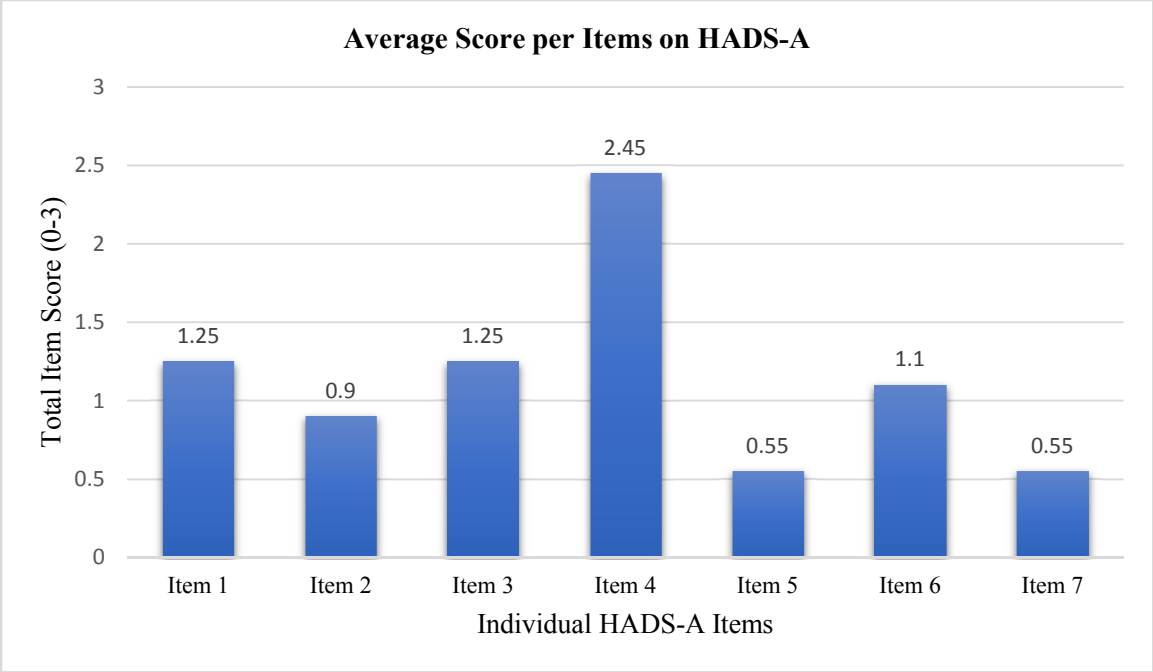


*Figure 4*: Average Score Per Item on HADS-A

**Outcome Measure III: OMT Consult Rate**

Of the seven patients who screened positive on the GADS-A, seven (100%) were referred to osteopathic medicine service for osteopathic manipulative treatment (OMT) and seven (100%) received OMT prior to discharge. This was determined through retroactive chart review using the electronic medical record (EMR). The presence of an admission osteopathic medicine consult order determined whether an OMT referral had been placed, while the presence of an osteopathic medicine treatment note determined whether the patient received OMT. See *Figure 5* below.

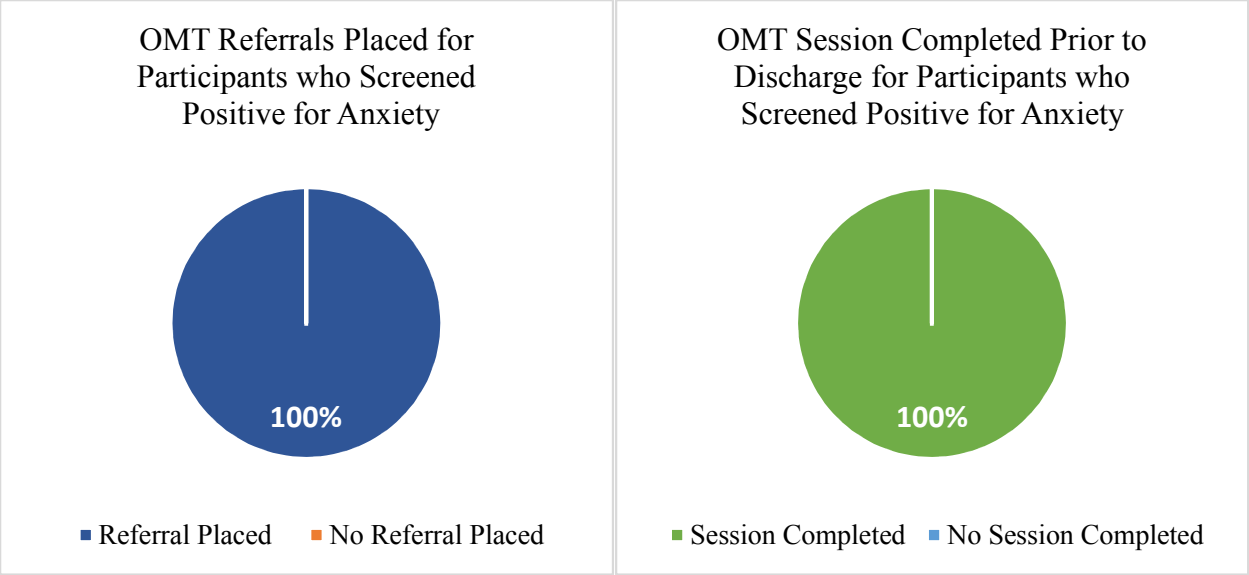


*Figure 5: OMT Referrals Placed and Sessions Completed Prior to Discharge for Participants who Screened Positive for Anxiety*

**Discussion**

Among the twenty participants screened for anxiety in this pilot project, seven screened positive for anxiety with a HADS-A score above 11. While it is not feasible to establish statistical significance with such a small sample size, more than one third of patients (35%) screened positive for anxiety within the context of this project. In addition, two of the participants were scored as "Borderline Abnormal" which demonstrates that 9 of the 20 patients demonstrated some evidence of anxiety on postoperative screening; this is nearly half as many as those who were classified as having a "Normal Score". We believe this is a high enough prevalence to encourage the continuation of anxiety screening among elective lumbar spine patients at UCSD – La Jolla.

Notably, the HADS-A item that returned the highest average screening score was Item 4, "I can sit at ease and feel relaxed" (2.45/3). Even more, six out of the seven participants who screened positive for anxiety scored this item as a 3. Because it is the only item which speaks to physical symptoms, and because of the implicit presence of physical discomfort and pain that accompany lumbar spine procedures, it is not surprising that the average scores on this item were markedly higher than all other

items. It is challenging to determine whether pain should be corrected for when considering anxiety among this patient population. On the one hand, postsurgical pain has evidently been a confounding variable in terms of scoring on the HADS-A tool; on the other, failing to consider pain as part of an assessment for anxiety among this specific patient population would be a failure to consider a major contributor to anxiety. Even more, the HADS-A was found to have a sensitivity of 91% and a specificity of 63% at a cut-off score of 8 out of 21 among rheumatoid arthritis patients, who also struggle with chronic pain. This suggests that the presence of anxiety can reasonably be assumed even at a score of 8 and that we have not been too liberal at classifying anxiety as such even in the presence of consistently high scores on the somatic metric (Item 4). Future research should further consider this relationship.

The implementation process of this project – as represented by the patient participation rate, the referral rate, and OMT consult rate – was very effectual in that we experienced 100% success in each of these three domains. The high participation is very likely attributable to the brevity of the screening tool (7 questions), the minimal amount of time it took to complete (approximately 3 minutes each), as well as it being conducted as an interview where participants were read the questions and shown the possible responses using a visual aid. When introducing long-term anxiety screening among this patient population, it will be important to consider these attributes and incorporate them into practice to maintain this high level of patient response.

The brevity of the tool also benefitted the project lead since it did not prove to be a significant time burden, which will also translate to other clinicians and is a crucial component of screening compliance on the part of providers. In this pilot project, provider compliance with conducting screening did not play a role since the project lead independently interviewed all participants. However, in planning to introduce anxiety screening into practice, it will be crucial to determine how to best incorporate the HADS-A into provider workflow so that screening of all eligible patients is conducted.

The same applies to the identification of eligible patients. Because the project lead exclusively identified eligible participants and did so daily for the entire length of the data collection period, all eligible patients were captured. As this screening becomes integrated into the inpatient workflow, it will

need to be decided if eligible patients will be elected manually by a unit-based champion, if the duty will fall on a neurosurgery or orthopedic spine provider, or if determination of eligibility will be coded into the EMR and in turn prompt staff to conduct screening.

While determination of eligibility can be achieved through a variety of means, embedding anxiety screening into the EMR is likely to be the most effectual way of ensuring that screens are documented and HADS-A score of >11) to automatically trigger a screen that allows an order for a specific referral (i.e., OMT) to be placed. Ultimately, this will allow for the maintenance of a high referral rate.

OMT consult rate was determined by three factors: timely referral, osteopathic provider availability, and length of hospital stay. To achieve timely referral, anxiety screening was conducted on postoperative day 1, thereby expanding the period between screening and discharge and allowing more time for osteopathic medicine to consult on patients who screened positive. We were nevertheless concerned that some patients who screened positive for anxiety may not remain hospitalized for long enough to permit OMT to take place, but ultimately did not find this to be the case. In other words, all patients with scores of 11 or above on the HADS-A remained inpatient long enough to be seen by osteopathic medicine. While length of stay was not considered in this project, it should be implicated in further research to establish if an association exists between anxiety and length of stay.

Lastly, we were interested to see whether the osteopathic medicine team would be able to take on an increased referral load, especially because the team follows patients regularly, sometimes daily, during their hospitalizations. The consult rate of 100% demonstrates that osteopathic medicine providers were, in fact, capable of attending to the additional patients we referred. This suggests that OMT can be relied on as a possible intervention for the management of state anxiety among UCSD – La Jolla's elective lumbar spine population in the immediate postoperative period. Further research into the specific benefit of OMT on state anxiety among UCSD – La Jolla's lumbar spine patients using post-treatment screening is recommended.

One significant limitation in this project was that it was a pilot and is not inherently sustainable in its procedures. With this initial data on board, stakeholders will need to become more actively involved so

that screening can be introduced as an ongoing component of the management of spine patients, as discussed above. A second limitation of this project was the restricted ability to conduct anxiety screening in Spanish. While the use of the hospital-approved interpreter service allowed Spanish-speaking participants to be screened, continued use of these services would mean that diction will be individually determined by each translator rather than stated in the wording that has been demonstrated to be valid and reliable. In addition, screening with the use of a translator took approximately 3 times as long as screening in English did, which will be a deterrent for clinicians as they conduct these anxiety screens. It will be crucial for this to be accounted for as the HADS-A is integrated into clinical practice to ensure that Spanish-speakers receive the same evaluation and treatment as English-speakers.

## Conclusion

Chronic lumbar spine disease patients are subject to a significant predisposition for anxiety as a function of their severe, longstanding chronic pain and resultant disability. Those who are candidates for surgical repair are especially at risk because their symptoms are the most burdensome. The postoperative period is a critical time for these patients as they face further stressors associated with severe postoperative pain, the challenges around postoperative recovery and reconditioning, and the loss of autonomy and familiarity that accompanies hospitalization. It is now commonly accepted that those postoperative spine patients who do, in fact, struggle with anxiety are at risk for worse postoperative outcomes, including worse pain, longer lengths of hospital stay, and higher rates of delirium and readmission.

We screened twenty of UCSD – La Jolla's postoperative elective lumbar spine surgery patients for postoperative anxiety using the anxiety domain of the Hospital Anxiety and Depression Screen and found that 35% screened positive, with an additional 10% screening "Borderline Abnormal". With this limited sample size, we cannot assume that the prevalence of anxiety we observed can be extrapolated as a representative of UCSD – La Jolla's general elective lumbar spine population. However, the suggestion that one in every three patients who undergo spinal procedures at our institution may suffer from postoperative anxiety should serve as sufficient impetus for a more rigorous study. Such a study should

also consider postoperative factors, such as pain severity, length of stay, the presence of a delay in patient mobilization, or even kinesiophobia as metrics and evaluate if correlations exist between these and anxiety.

Osteopathic medicine has been shown to alleviate anxiety symptoms among postoperative patients; however, limited data exists on its influence among postsurgical lumbar spine patients specifically. Throughout the two-week duration of screening, we observed that 100% of the patients who screened positive for anxiety were referred to and treated by osteopathic medicine. This suggests that the osteopathic medicine service at UCSD – La Jolla may be robust enough to manage the additional consult load. With these resources already in place, future research should also consider the introduction of post-OMT anxiety screening to evaluate the impact of OMT on postoperative anxiety.

## DNP Essentials

This project fulfilled DNP Essential I, Scientific Underpinnings of Practice, by allowing us to consider a current practice issue dealing with a patients' health status, both physical and psychosocial, and begin to introduce a well-informed process that hopes to improve the perceived issue. The practice issue, specifically, was the observation that patients with anxiety after elective spine procedures appeared to have worse postoperative courses than those without evident anxiety. A comprehensive literature review was then conducted and demonstrated that, indeed, patients with mental health disorders who had undergone elective lumbar spine procedures were at higher risks for worse postoperative outcomes. This nature of mental health illness, anxiety specifically, as a risk factor for poor patient outcomes became the primary focus on this project and is consistent with DNP Essential VII, Clinical Prevention and Population Health for Improving the Nation's Health

Naturally, the knowledge obtained via this literature review helped to inform the specific goals and the methodology of this project, further answering the goals of DNP Essential I. The appraisal of literature specifically and the use of the Johns Hopkins Nursing Evidence-Based Practice tool were instrumental in fulfilling DNP Essential III, Clinical Scholarship and Analytical Methods for Evidence-Based Practice. Conducting the evidence appraisal was massively instructive in that it provided me with

an entirely new perspective and skillset that has enabled me to more analytically consumer scientific literature. The application of the Neuman Systems Model as the guiding theoretical framework, then, additionally focused the project. The Neuman Systems Model itself is notably reflective of this Essential in its consideration of individuals as whole entities in continuing interaction with their environment.

The introduction of science into practice mentioned above is also consistent with DNP Essential II, Organizational and Systems Leadership for Quality Improvement and Systems Thinking. However, the most notable representation of this Essential was the necessity to comply with organization policy as we worked to obtain approval to initiate procedures at UCSD. Because UCSD's protocols different from those of UC Irvine, we were required to make significant changes to the original methodology so that it would be consistent with the expectations of the institution where the project was being introduced.

The interprofessional collaboration component of this project was one of its largest successes and is reflective of DNP Essential VI, Interprofessional Collaboration for Improving Patient and Population Health Outcomes. The planning and completion of this project involved three entirely separate medical disciplines: neurosurgery, orthopedic spine, and osteopathic medicine. The project lead was required to attain buy-in from each individually, and consider their unique perspectives, approaches to managing elective lumbar spine patients, and practice limitations. Ultimately, we were not only able to achieve passive support from the involved providers, but also active participation as evidenced by the 100% success rates of OMT referrals placed and treatments performed for patients with postoperative anxiety.

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# APPENDIX A: Site approval/authorization letter

Date: 4/4/2022

To: Victoria Rusinov and Dawn Carroll

Re: Project # 321
Introducing Postoperative Anxiety Screening among Elective Lumbar Spine Patients at UCSD-La Jolla

Dear Victoria & Dawn,

Your project has been reviewed by the UCSD ACQUIRE (Aligning and Coordinating Quality Improvement, Research, and Evaluation) Committee. The ACQUIRE Committee approval of this project included a determination that the project is not regulated as research involving human subjects as defined in 45 CFR 46 or 21 CFR 56 and does not require Institutional Review Board review or approval. Consistent with UCSD policy and federal regulations, the UCSD Office of IRB Administration (OIA) has delegated authority to the ACQUIRE Committee to make such determinations. The Director and/or Medical Director of the Office of IRB Administration (OIA) are members of the ACQUIRE Committee.

Though certified as not human subjects research, the project leader should ensure that the activities associated with the project are conducted in compliance with applicable UCSD and Rady Children's Hospital-San Diego policies and ethical standards as well as local, state, and federal regulations.

In addition, this approval is based on the intended work and scope of activities outlined in the proposal that was submitted. If the nature or scope of this activity changes substantially, then a re-evaluation by the ACQUIRE Committee would be necessary.

Should you have any questions, please contact the Robert El-Kareh at relkareh@health.ucsd.edu.

Sincerely,

Robert El-Kareh, MD, MS, MPH
Chair, ACQUIRE Committee
relkareh@health.ucsd.edu

# APPENDIX B: Kuali Approval Email

Dear Victoria Rusinov,

The University of California, Irvine (UCI) Human Research Protections (HRP) Program complies with all review requirements defined in 45 CFR Part 46 and 21 CFR 50.3.

**Based on the responses provided in Non Human Subjects Research (NHSR): #692 - "Anxiety & Depression on Postoperative Outcomes among Adults Undergoing Elective Lumbar Spine Surgery at University of California – San Diego Medical Center – La Jolla ", and per the definitions cited below, the activities do not constitute human subject research or a clinical investigation, as applicable. Therefore, *UCI IRB review is not required and will not be provided.***

45 CFR 46.102(l) defines research as "a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge; and 45 CFR 46.102(e)(1) defines a human subject as "a living individual about whom an investigator conducting research obtains (i) Obtains information or biospecimens through intervention or interaction with the individual, and uses, studies, or analyzes the information or biospecimens; or (ii) Obtains, uses, studies, analyzes, or generates identifiable private information or identifiable biospecimens."

21 CFR 50.3(c) defines a clinical investigation as "any experiment that involves a test article and one or more human subjects and that either is subject to requirements for prior submission to the Food and Drug Administration under section 505(i) or 520(g) of the act, or is not subject to requirements for prior submission to the Food and Drug Administration under these sections of the act, but the results of which are intended to be submitted later to, or held for inspection by, the Food and Drug Administration as part of an application for a research or marketing permit."

APPENDIX C: Search Terms and Results

**Major Concepts: post-operative outcomes, elective lumbar spine surgery, peri-operative anxiety, depression, pain catastrophizing**

**PubMed 20210428**

**Possible Medical Subject Headings (MeSH):**

"Lumbar Vertebrae/surgery"[Mesh]

"Elective Surgical Procedures"[Mesh]

"Postoperative Period"[Mesh]

"Treatment Outcome"[Mesh]

"Anxiety"[Mesh:NoExp]

"Catastrophization"[Mesh]

"Pain, Postoperative"[Mesh:NoExp]

"Depression"[Mesh]

"Depressive Disorder"[Mesh:NoExp]

"Depressive Disorder, Major"[Mesh]

"Depressive Disorder, Treatment-Resistant"[Mesh]

"Dysthymic Disorder"[Mesh]

"Seasonal Affective Disorder"[Mesh]

**Keywords:**

elective

lumbar AND (spinal OR spine) AND surger*)

post-operative OR postoperative

anixiet* OR anxious

(pain AND (catastrophization OR catastrophisation))

depression

outcome*

("Lumbar Vertebrae/surgery"[Mesh] OR (lumbar AND (spinal OR spine) AND surger*)) AND ("Elective Surgical Procedures"[Mesh] OR elective) AND ("Anxiety"[Mesh:NoExp] OR "Catastrophization"[Mesh] OR "Pain, Postoperative"[Mesh:NoExp] OR "Depression"[Mesh] OR "Depressive Disorder"[Mesh:NoExp] OR "Depressive Disorder, Major"[Mesh] OR "Depressive Disorder, Treatment-Resistant"[Mesh] OR "Dysthymic Disorder"[Mesh] OR "Seasonal Affective Disorder"[Mesh] OR (pain AND (catastrophization OR catastrophisation)) OR anixiet* OR anxious OR depression OR depressed)

Filters applied: in the last 10 years, English

Results: 70

**CINAHL Complete 20210428**

(MH "Lumbar Vertebrae/SU") OR (lumbar N3 (spinal OR spine) N3 surger*)

AND

(MH "Surgery, Elective") OR elective

AND

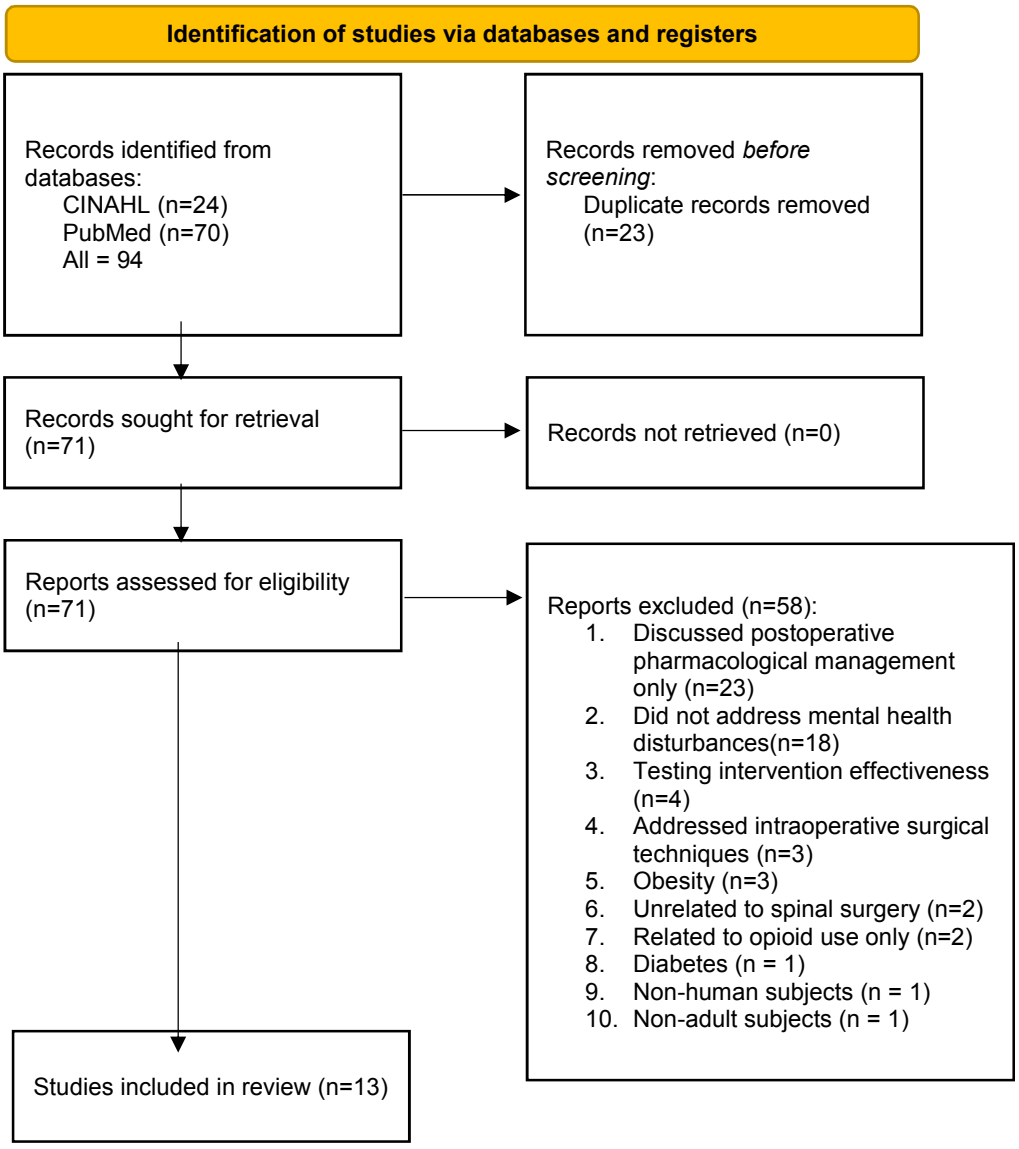
(MH "Anxiety") OR (MH "Catastrophization") OR (MH "Postoperative Pain") OR (MH "Depression") OR (MH "Dysthymic Disorder") OR (MH "Seasonal Affective Disorder") OR (pain AND catastrophi*) OR anixiet* OR anxious OR depression OR depressed OR depressive

Limiters - Published Date: 20100101-; English Language

Expanders - Apply related words; Apply equivalent subjects

Results: 24

APPENDIX D: PRISMA Chart



APPENDIX E: Table of Evidence

| Study Purpose & Title | Study Design & Sample | Measure | Key Results | Level of Evidence |
|---|---|---|---|---|
| Authors: Jain, Deeptee; Singh, Paramjit; Kardile, Mayur; Berven, Sigurd<br><br>Title: A validated preoperative score for predicting 30-day readmission after 1–2 level elective posterior lumbar fusion<br><br>Year: 2019<br><br>Purpose: To develop a model to predict 30-day readmission rates in elective 1–2 level posterior lumbar spine fusion (PSF) patients → identify risk factors for readmission and quantify the increase in risk & create a scale that can accurately predict the risk of readmission & validate this scale is a separate cohort of patients | Design: Retroactive. Case control study of an administrative claims database (State Inpatient Database or SID). Patients were randomly assigned to the derivation cohort or the validation cohort with the use of a random number generator with a 50:50 split. Stepwise multivariate regression was performed.<br><br>Tools: N/A<br><br>Sample: Derivation cohort *(n*=92, 262) & validation cohort *(n*=90,257) from multiple US states between 2005-2010.<br><br>*Exclusion criteria: Patients were excluded if they had ICD-9 codes for any of the following diagnoses: bone cancer/metastases, infection, and trauma* | Independent variables: Demographic data (i.e., age, gender, race, insurance, physical health-related comorbidities) Depression (per ICD code) Anxiety (per ICD code)<br><br>Dependent variables: Readmission rates<br><br>Limitations: Coding error | Findings: 30-day readmission rates were 10.9% and 11.1% respectively. Depression did but anxiety did not appear tocontribute to 30 day readmission | IIA<br><br>Justification: II: Control w/ randomization A: Sufficient sample size, multicenter, with randomized control into derivation & validation cohorts. Generalizable. High value of statistical significance - $p$ <0.001 considered predictive. N=4 excluded. Findings of predictive values consistent with literature findings about risk factors. No specific mention of future interventions. Patient characteristics via ICD-9 codes. |

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|---|---|---|---|---|
| Authors: McGirt, Matthew; Bydon, Mohamad; Archer, Kritin; et al.<br><br>Title: An analysis from the Quality Outcomes Database, Part 1. Disability, quality of life, and pain outcomes following lumbar spine surgery: predicting likely individual patient outcomes for shared decision-making<br><br>Year: 2017<br><br>Purpose: Develop a predictive model for 12-month postoperative pain, disability, and QOL in patients undergoing lumbar spine surgery | Design: Prospective. Authors assessed baseline, 3-month and 12-month patient-reported outcomes vie telephone interviews.<br><br>Tools:: Oswestry Disability Index (ODI), EQ-5D, numbering rating scale (NRS) for back pain (BP) and leg pain (LP)<br><br>Sample: 7618 patients (from 74 participating centers across 26 US states) who had completed 12 month follow-up after having undergone elective lumbar spine surgery | Independent variables: Age, gender, BMI, race, education level, history of prior surgery, smoking status, comorbid conditions, symptom duration, indication for surgery, number of levels, approach, compensation, insurance status, ambulatory activity<br><br>Dependent variables: post-operative QOL, pain levels<br><br>Limitations: No controls | Findings: There was a significant improvement in all PROs ($p < 0.0001$) at 12 months following lumbar spine surgery.<br><br>Anxiety/ depression were predictors of overall disability | IIIA<br><br>Justification<br>III: No control group, purely descriptive<br>A: Sufficient sample size, multicenter, generalizable, no control; all included in analysis. Correction for sufficient possible confounding variables. Rigorous evaluation of patient characteristics (via interviews & screening tools, not via chart review) *EQ-5D anxiety/depression scale evaluates anxiety/depression via Likert of presence of anxiety/ depression. Large sample size but only 71.2% retention. Discussion considered practice implications as they relate to findings from other literature. 12-month long follow up. |
| Authors: Floyd, Hollis; Sanoufa, Mazen; Robinson, Joe | Design: Retrospective study via single facility medical records | Independent variables: history of anxiety, depression, anxiolytic use | Findings: Patients with a history of anxiety who were on anxiolytics had | IIC<br><br>Justification<br>II: Comparison of groups |

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|---|---|---|---|---|
| Title: Anxiety's Impact on Length of Stay Following Lumbar Spinal Surgery<br><br>Year: 2015<br><br>Purpose: Determine whether anxiety may affect length of stay among elective lumbar spine patients | Sample: All patients at single institution who underwent elective lumbar decompression and fusion surgery from October 2010 through September 2013 (n=307) | Dependent variables: Length of stay (LOS)<br><br>Confounding variables: Number of operated levels, postoperative Hgb, postoperative PE, postoperative urinary retention<br><br>Limitations: Diagnoses ascertained from charts rather than determined by diagnostic testing, compounding factors rather than independent variables could have determined LOS | the longest LOS (more than those with history of anxiety who were not taking anxiolytics) | C: Sufficient consideration of possible confounding variables with statistical strength of $p<0.05$. Insufficient sample size in each comparison group. Not a rigorous determination of patient characteristics (chart review used only). As well, difficult to establish validity of cohort (e.g., anxiolytics often used for pain management among spine patients). Implications of findings supposed without a well-informed consideration of implications on practice. |

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|---|---|---|---|---|
| Authors: Sayadipour, Amirali; Kepler, Christopher; Mago, Rafnish, et al.<br><br>Title: Economic Effects of Anti-Depressant Usage on Elective Lumbar Fusion Surgery<br><br>Year: 2015<br><br>Purpose: To define the costs of inpatient care for patients taking anti-depressant medications in comparison to those not taking antidepressant medications | Design: Retrospective study using medical records<br><br>Sample: Patients treated with elective lumbar fusion by a single surgeon between 2006 and 2010 at a large teaching hospital (n=142) | Independent variables: Antidepressant use<br><br>Dependent variables: Total charges, total payment received, variable cost, fixed cost per institution's accounting department<br><br>Limitations: statistical power limited by sample size, unclear whether antidepressants were used as mood-altering drugs or rather to treat chronic psychosomatic pain | Findings:<br><br>Antidepressant usage conferred a 22% increase in cost, 19% increase in fixed cost. No statistically significance difference in length of stay between the 2 groups. | IIC<br><br>Justification<br>II: Comparison of groups<br>C: Small sample size which limits statistical significance & limits ability to arrive at definitive conclusions; all *p*-values >0.05. Cohort study. Single center & single surgeon – not generalizable. Sufficient discussion of findings as they relate to literature review & consideration of practice implications along with recommendations based on literature. |
| ABSTRACT<br><br>Authors: Elsamadicy, Aladine; Ren, Xinru; Kemedy, Hanna; et al.<br><br>Title: Independent Associations with 30- and 90-Day Unplanned Readmissions After Elective Lumbar Spine Surgery: A National Trend Analysis of 144 123 Patients<br><br>Year: 2018 | Design: Retrospective study via National Readmission Database<br><br>Sample: All patients who underwent elective lumbar spine surgery between 2013 and 2014 (n=144,123) | Independent variables: age, insurance status, COPD, depression, hypertension, diabetes, deficiency anemia, obesity, obesity<br><br>Dependent variables: Unplanned readmission<br><br>Limitations: Diagnoses ascertained from charts rather than determined by diagnostic testing | Findings: Depression was independently associated with unplanned readmission | Evaluation N/A |

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|---|---|---|---|---|
| Purpose: Determine patient risk factors associated with 30-d and 90-d unplanned readmission following elective lumbar spine surgery | | | | |
| Authors: Amaral, Vivian; Marchi, Luis; Martim, Heber; et al.<br><br>Title: Influence of Psychosocial Distress in the Results of Elective Lumbar Spine Surgery<br><br>Year: 2017<br><br>Purpose: To compare surgical outcomes in patients with or without psychosocial issues | Design: Single center retrospective and comparative study using completed questionnaires pre-op and at follow up (6-12 months after surgery)<br><br>Sample: Patient with mild (green group) or moderate (yellow group) psychosocial per psychological evaluation at single institution (n=136) | Independent variables: Depression (HAD-D questionnaire), anxiety (HAD-A questionnaire), previous psychological/ psychiatric treatment, abuse of prescription of illegal drugs, alcohol use, sleep quality, marital status, employment status, involved in ongoing litigation<br><br>Dependent variables: visual analogue scale (VAS), Oswerty Disability Index (ODI), EuroQol 5D (EQ-5H)<br><br>Limitations: limited sample size, retrospective study design though data had been collected prospectively, single-center, subjectivity of psychologist performing evaluations | Findings: Patients in the yellow group have higher level of depression, secondary gains and/or work compensation and evolve with worse results following elective lumbar spine surgery. The results from the study revealed that patients presenting significant psychosocial distress at the time of surgical indication had lower quality of life and more severe physical disability | IIB<br><br>Justification<br>II: Comparison of groups<br>B: Small sample size. Insufficient consideration of possible confounding variables. Likely not generalizable. Rigorous evaluation of patient characteristics with anxiety/ depression determined via psych professional & other factors determined by screening tools. Fairly definitive conclusions. Extensive discussion of findings as they relate to evidence from literature w/ consistent recommendations<br><br>. |

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|---|---|---|---|---|
| ABSTRACT<br><br>Authors: Tharin, Suzanne; Mayer, Eric; Krishnaney, Ajit<br><br>Title: Lumbar Microdiscectomy and Lumbar Decompression Improve Functional Outcomes and Depression Scores<br><br>Year: 2012<br><br>Purpose: Determine the influence of lumbar microdiscectomy/ lumbar decompression on postoperative pain, disability, quality of life & depression | Design: Prospective<br><br>Sample: All patients at the Cleveland Clinic undergoing lumbar microdiscectomy or lumbar decompression | Independent variables: Preoperative depression (via PHQ-9) and quality of life (via EuroQOL), pain & disability (via PDQ = pain disability questionnaire & Rankin scores). Unsure of duration of follow-up<br><br>Dependent variables: Postoperative depression & quality of life<br><br>Limitations: N/A | Findings: Our outcome data indicate that microdiscectomy and lumbar decompression not only reduce disability and pain but also improve depressive symptoms and overall quality of life for patients. | Evaluation N/A |
| Authors: Angelini, Eva; Wijk, Helle; Brisby, Helena; et al.<br><br>Title: Patients' Experiences of Pain Have an Impact on Their Pain Management Attitudes and Strategies<br><br>Year: 2018<br><br>Purpose: To identify areas of improvement for future structural changes in pain management | Design: Qualitative study using focus group interviews<br><br>Sample: Patients who underwent spine surgery at a university hospital in Sweden during April and May, 2016 (n=13) | Interview Questions:<br>1. Could you describe a situation where you felt/didn't feel confident with the staff?<br>2. Could you describe a situation where you had a positive/a less positive interaction with the staff?<br>3. Could you describe a situation where you participated/ didn't participate in your pain management/treatment ?<br>4. What would an optimal pain treatment look like? | Findings: Pre- and post-surgical anxiety was significant and primarily related to a knowledge deficit | IIIB<br><br>Justification Somewhat small sample size for this design. Recruitment via convenience sample; single center. Semi-structured interviews with ability to determine 3 categories of patient concern. Extensive discussions of findings as they relate to supporting body of literature & |

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|---|---|---|---|---|
| | | 5. What could have been done differently/better in the situations you described. Any suggestions? | | consistent/ specific recommendations for clinical practice |
| Authors: Hart, Robert; Perry, Elizabeth; Hiratzka, Shannon; et al.<br><br>Title: Post-Traumatic Stress Symptoms After Elective Lumbar Arthrodesis are Associated with Reduced Clinical Benefit<br><br>Year: 2013<br><br>Purpose: To assess the impact of postoperative post-traumatic stress disorder (PTSD) symptoms on clinical outcomes after lumbar arthrodesis. | Design: Prospective cohort study with questionnaires completed at 6 weeks, 3 months, 6 months, 9 months, and 1 year postoperatively<br><br>Sample: Patients undergoing elective lumbar spinal arthrodesis at a single institution (n=73) | Independent variables: PTSD Checklist-Civilian Version (PCL-C) scores at 6 weeks, 3 months, 9 months, and 1 year postoperatively (preoperative spinal diagnosis, age, sex education level, employment status, prior major psychiatric diagnosis - major depression, bipolar disorder, schizophrenia, generalized anxiety disorder, panic disorder, and adjustment disorder), history of prior lumbar spine surgery)<br><br>Dependent variables: Clinical outcomes determined by the scores on Short-Form 36 Health Status Questionnaire (SF-36) and Oswerty Disability Index (ODI) pre-operatively and at 1 year post-op<br><br>Limitations: detailed information re: length of fusion and duration of surgery were not analyzed; other possible confounding variables for poor clinical outcome | Findings: Patients with preoperative psychiatric diagnoses had higher final ODI scores at 1 year postoperatively than those without (39.5 vs. 25.1; P = 0.008). | IIIB<br><br>Justification<br>III: No comparison group; descriptive study<br>B: Small sample size Accounted for many baseline as well as intraoperative and postoperative variables which could have contributed to onset of PTSD symptoms. Rigorous determination of PTSD through prospective screening. Consistent results (PTSD demonstrated to have effect on all measured postoperative outcomes); unlikely generalizable due to limitation of sample size. Little discussion of outcomes as they relate to existing literature; no discussion re: implication for practice. 12 month follow-up. |

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|---|---|---|---|---|
| Authors: Wagner, Arthur; Shiban, Youssef; Wagner, Corinna; et al.<br><br>Title: Psychological predictors of quality of life and functional outcome in patients undergoing elective surgery for degenerative lumbar spine disease<br><br>Year: 2019<br><br>Purpose: To quantify the correlation between patients' psychopathological predispositions, disability and health-related quality of life after surgery for degenerative lumbar spine disease | Design: Prospective with screening prior to surgery, after 3 months and 12 months<br><br>Sample: n=180 | Independent variables: Depression via Center for Epidemiological Studies Depression Scale (ADS-K), PTSD via Post-Traumatic Stress Scale–10 (PTSS-10), anxiety via State Trait Anxiety Inventory–State Anxiety and State Trait Anxiety Inventory–Trait Anxiety (STAI-S and STAIT) & Anxiety Sensitivity Index–3 (ASI-3)<br><br>Dependent variables: Quality of life via EuroQol 5D (EQ) and Short Form-36 = SF-36, disability via Oswestry Disability Index = ODI) scores.<br><br>Limitations: No observational control (reduces statistical power), | Findings: Depressed patients exhibited impaired mean scores of EQ and ODI mean scores at baseline, which significantly improved and converged with scores of non-depressed patients after 12 months<br><br>The results suggest that a proposition for focused psychological perioperative support for select patients is not unwarranted. | IIIA<br><br>Justification<br>III: No comparison of groups; observational study<br>A: German. Limited sample size given amount of confounders considered; single center. Valid/ reliable tools for their respective psychological dimensions (do they need to be for postoperative population?). Rigorous determination of patient characteristics/ outcomes through prospective screening with validated tools. Less comprehensive consideration of demographic factors compared to other studies (comorbidities). Consistent findings. Extensive consideration of findings as they compare to other pertinent literature; discussion of implication for practice. 12 month follow-up. |

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| Authors: Falavigna, Asdrubal; Righesso, Orlando; Teles, Alisson; et al.<br><br>Title: Responsiveness of depression and its influence on surgical outcomes of lumbar degenerative disease<br><br>Year: 2015<br><br>Purpose: To demonstrate the responsiveness of depression after surgery for lumbar degenerative disease and to verify the impact of this condition on surgical outcomes | Design: Prospective cohort study, evaluated postoperatively, at 30 days and 1 year<br><br>Sample: Patients (n=91) with degenerative disease without response to conservative treatment between 2009 and 2011 | Independent variables: Preoperative measures of disability (Oswerty Disability Index), health-related quality of life (HRQoL), satisfaction (Satisfaction Index), fears and beliefs (fear-avoidance beliefs questionnaire = FABq), and psychological disorders (Beck Depression Index, Short-form 36)<br><br>Dependent variables: Depression in the postoperative period<br><br>Limitations: No evaluation about the importance of mechanisms involved in emotional distress, depression determined via patient-report scale of generalized well-being rather than a diagnostic tool | *Findings:* Evaluation of the depressive symptoms during the postoperative period is more important because the presence of depression in this period had a more negative impact on clinical outcome than in the preoperative period. | IIB<br><br>Justification<br>II: Comparison of outcomes groups<br>B: Insufficient sample size for amount of variables considered. Rigorous determination of outcomes with prospective screening. Limited demographic variables considered which could account for depression pre/ postoperatively. Intraoperative factors mostly considered – no significant influence found, possibly due to small sample size. 12 month follow up. Able to draw fairly definitive conclusions about depression's impact on postsurgical outcomes & trend responsiveness of depression after recovery, but unable to evaluate possible predisposing factors. Findings likely not generalizable. Discussion of |

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| | | | | how findings of present study compare to findings of similar literature, but no discussion about implications to clinical practice/ no recommendations offered. |
| Authors: Mezzacapa, Frank; Schmidt, Kyle; Tenny, Steven; et al.<br><br>Title: Review of Psychiatric Comorbidities and Their Lumbar Associations with Opioid Use in Elective Lumbar Spine Surgery<br><br>Year: 2020<br><br>Purpose: To identify psychiatric comorbidities that are linked to opioid use in the setting of elective lumbar spine surgery | Design: Retrospective single-site systematic chart review<br><br>Sample: VA patients undergoing elective lumbar surgery (n=376) | Independent variables: Narcotic use pre-op (yes/no), age, race, gender, BMI, psychiatric conditions (MDD, anxiety/ panic disorder, Bipolar, PTSD)<br><br>Dependent variables: Narcotic use in morphine equivalents x days used within 90 days post<br><br>Limitations: "Morphine use" is defined by prescribed morphine, not actual consumption; evaluated based on single prescriber; diagnoses based on medical data; homogenous patient population | Findings: *Patients with MDD had 1.78x the odds of using opioids prior to surgery. Patients with MDD used opioids an average of 475.30 morphine-equivalent-days ore after surgery (not statistically significant, p=0.6)*<br><br>PTSD → 673.64 more morphine-equivalent days (statistically significant) | IIIC<br><br>Justification<br>III: No comparison of groups, observational study<br>C: Sufficient sample size. Patient characteristics, including PTSD & depression, derived from chart review. Extensive consideration of demographic variables' impact on pre and postoperative opioid use. However, preoperative opioid use evaluated via dichotomous variable – limited evaluation of impact of extent of preoperative opioid use. Study likely generalizable to VA population. Measured outcome variable not directly |

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| | | | | reflective of intended outcome variable; as such, unable to draw consistent conclusions. Sufficient consideration of findings as they relate to existing literature; sufficient suggestion for future practice. |
| Authors: Jimenez-Almonte, Jose; Hautala, Gavin; Abbenhus, Eric; et al.<br><br>Title: Spine Patients Demystified: What Are the Predictive Factors of Poor Surgical Outcome in Patients After Elective Cervical and Lumbar Spine Surgery<br><br>Year: 2020<br><br>Purpose: To investigate the effect of preexisting mood disorders on (1) pre- and postoperative patient-reported outcomes, (2) complications, and (3) pre- and postoperative opioid consumption in patients undergoing elective cervical | Design: Single institution retrospective review from 2014-2017<br><br>Sample: n=435 (179 cervical, 256 lumbar) | Independent variables: Patient preoperative diagnosis of psychiatric mood disorder (eg, depression, anxiety, schizophrenia, bipolar, or dementia), baseline characteristics, medical (nonpsychiatric) comorbidities, operative variables, and surgical complications (e.g., superficial and deep infection, wound complication, emergency department [ED] visits, readmissions, and repeat operations) @ pre-op, 2, 6, 12 weeks after surgery<br><br>Dependent variables: Quantitative measurements of pain (visual analog scale [VAS]) and spinal region-specific disability scores (Neck Disability Index [NDI] and Oswestry Disability Index [ODI]) pre-operatively | Findings: There were no differences in ODI pain scores at any time points between lumbar patients with or without diagnosed mood disorders (p=.73); however, those with mood disorders had significantly worse VAS pain scores both before and following surgery (p=.02). | IIIA<br><br>Justification: III: no comparison of groups<br>A: Sufficient sample size. Although a retrospective design, rigorous determination of patient outcomes via validated screening tools. Many patient demographics and determination of psychiatric disorder still determined via chart review. Extensive consideration of patient demographic/ surgical factors and statistical relationship to outcomes. Limited discussion of how study outcomes compare to existing |

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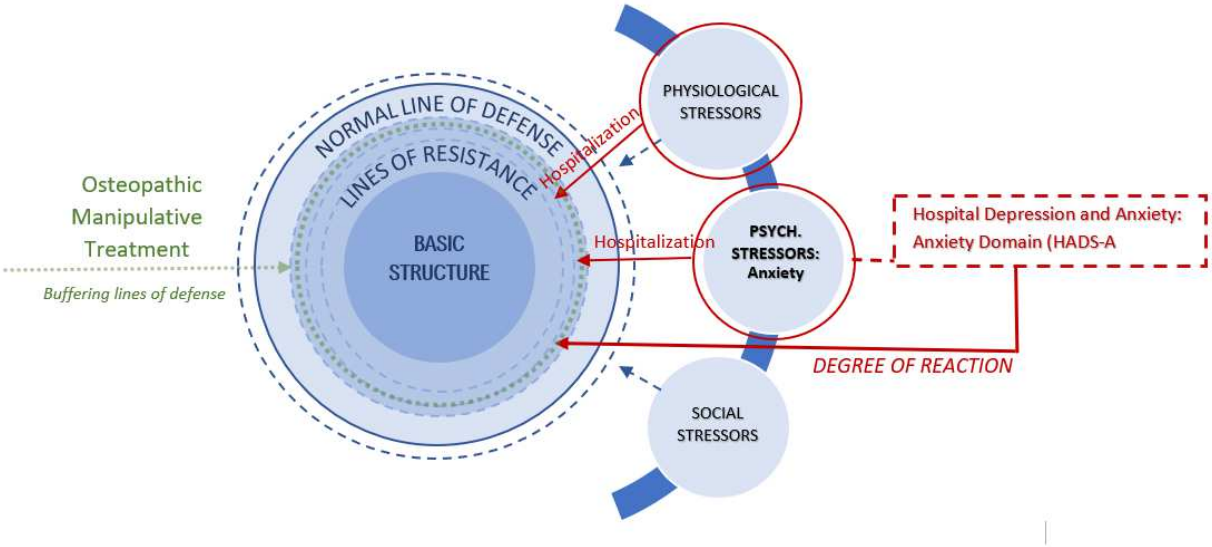
| or lumbar spine surgery | | and @ 12 weeks after surgery<br><br><u>Limitations</u>: Retrospective data based on diagnoses rather than screening, some incomplete records, lacking generalizability due to single academic institution study | | literature, but mention of limitations in literature; no recommendations for future practice. |

APPENDIX F: Level of Evidence Guide

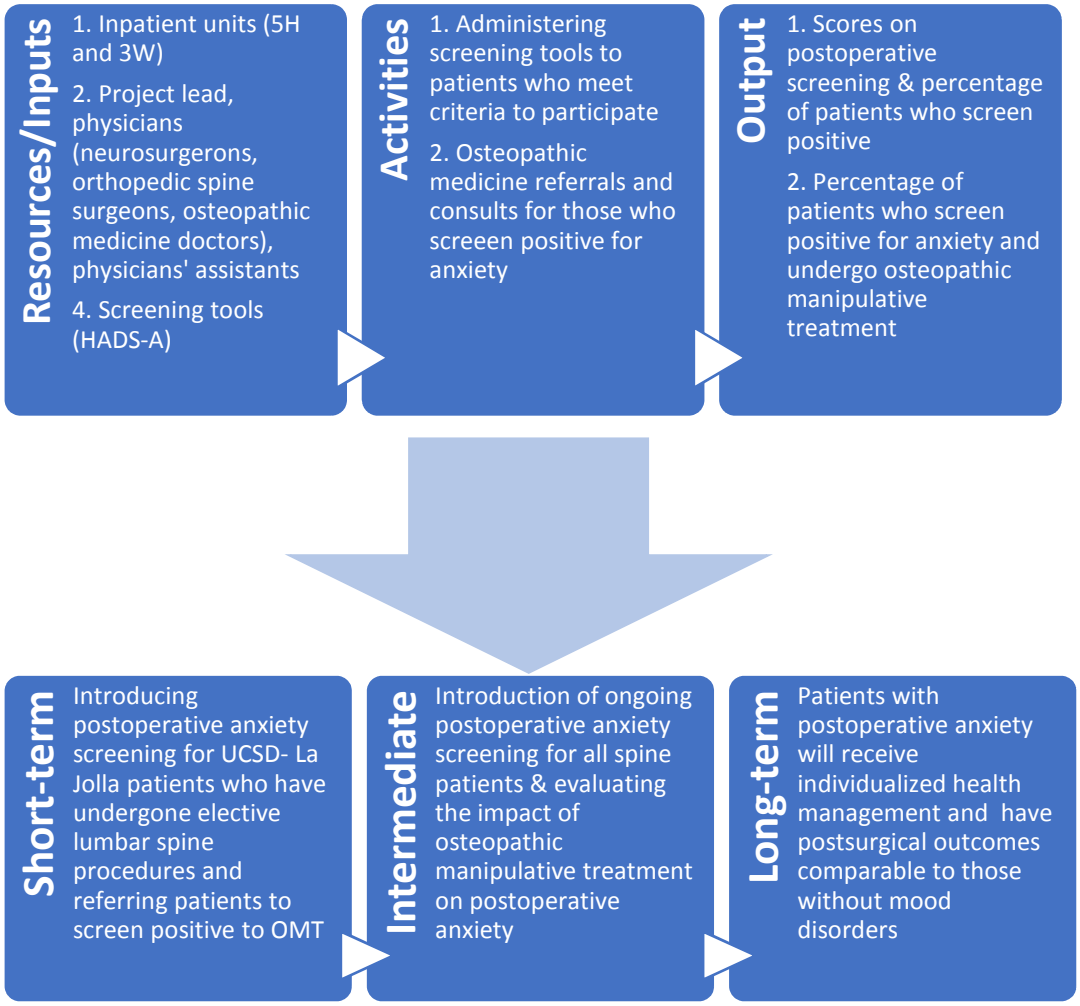
**Johns Hopkins Nursing Evidence-Based Practice**
**Appendix C: Evidence Level and Quality Guide**

| Evidence Levels | Quality Guides |
|---|---|
| **Level I**<br>Experimental study, randomized controlled trial (RCT)<br>Systematic review of RCTs, with or without meta-analysis | **A** **High quality:** Consistent, generalizable results; sufficient sample size for the study design; adequate control; definitive conclusions; consistent recommendations based on comprehensive literature review that includes thorough reference to scientific evidence<br><br>**B** **Good quality:** Reasonably consistent results; sufficient sample size for the study design; some control, fairly definitive conclusions; reasonably consistent recommendations based on fairly comprehensive literature review that includes some reference to scientific evidence<br><br>**C** **Low quality or major flaws:** Little evidence with inconsistent results; insufficient sample size for the study design; conclusions cannot be drawn |
| **Level II**<br>Quasi-experimental study<br>Systematic review of a combination of RCTs and quasi-experimental, or quasi-experimental studies only, with or without meta-analysis | |
| **Level III**<br>Non-experimental study<br>Systematic review of a combination of RCTs, quasi-experimental and non-experimental studies, or non-experimental studies only, with or without meta-analysis<br>Qualitative study or systematic review with or without a meta-synthesis | |

APPENDIX G: Conceptual Framework



APPENDIX H: Logic Model



APPENDIX I: Recruitment Material

Hello,

I am completing a doctoral project that aims to understand patients' emotional states after back surgery. If it's okay with you, I would like to ask you a few questions about how you are feeling right now.

I just have a few questions so I expect this will take 3-5 minutes.

If you agree to participate, I will read the questions to you and ask you to respond after every question using the options I show you.

Some of the questions ask about the same thing in different ways. This is so I can be sure I can understand how you feel.

There is no right or wrong answer to any question and you may stop participating at any time.

Your responses will not be a part of your medical record.

Would you like to participate?

Thank you so much for your time.

APPENDIX J: Data Collection Instruments

Participant ID: _____

1. **I feel tense or "wound up"**
   A. Most of the time
   B. A lot of the time
   C. From time to time, occasionally
   D. Not at all

2. **I get a sort of frightened feeling as if something awful is about to happen**
   A. Very definitely and quite badly
   B. Yes, but not too badly
   C. A little, but it doesn't worry me
   D. Not at all

3. **Worrying thoughts go through my head**
   A. A great deal of the time
   B. A lot of the time
   C. From time to time, but not too often
   D. Only occasionally

4. **I can sit at ease and feel relaxed**
   A. Definitely
   B. Usually
   C. Not often
   D. Not at all

5. **I get a sort of frightened feeling like 'butterflies' in the stomach**
   A. Not at all
   B. Occasionally
   C. Quite often
   D. Very often

6. **I feel restless as I have to be on the move**
   A. Very much indeed
   B. Quite a lot
   C. Not very much
   D. Not at all

7. **I get sudden feelings of panic**
   A. Very often indeed
   B. Quite often
   C. Not very often
   D. Not at all

APPENDIX K: Formative/ Summative Evaluation Charts

Formative Evaluation

| Question | Discussion Notes |
|---|---|
| What challenges are we meeting while implementing the project procedures? What may help mitigate these challenges? | Challenges: Ensuring that OMT consults are entered in a timely fashion. Solutions: Ensure that referral requests are verbalized directly to providers and ensure provider confirmation. For orthopedic spine, the project lead will assign the NP as the primarily contact person and specifically request that she place the order (even after hours) – the NP has agreed. For neurosurgery, since more direct communication with these providers, the provider on call will be approached. |
| What components of project procedure implementation appear to go smoothly? | Identification of eligible patients, patient participation, provider support. |
| What are the associated costs of project implementation (financial and otherwise)? Do these need to be better managed? | Minimal costs associated with printing/ laminating of necessary materials and daily transportation to hospital. All are well-managed. |
| What is the participation rate among eligible patients? Can procedures be changed to improve this? | Patient participation is 100% so far. |
| Is patient confidentiality being maintained? Are any modifications necessary? | Disclosed only to providers during referral request |

Summative Evaluation

| Question | Discussion Notes |
|---|---|
| Were any further challenges met during the implementation of this project? | Solution brought about by formative evaluation to directly message orthopedic spine NP was successful. NP and project lead maintained effective communication throughout data collection, NP was very responsive and involved.<br>It was not always possible for the project lead to remain in the hospital to ensure that referrals were placed following requesting it from provider. However, most referrals were able to be requested in person with provider confirmation that order will be placed. |
| What components of project procedure implementation went smoothly? | Patient response continued to be a success with 100% of approached patients participating. Project lead had sufficient flexibility and was able to accommodate for changes in surgical schedule. Because project lead collected all data independently, all eligible patients were captured and screened. |
| Did any costs arise? | No further costs arose. |
| Did patient participation remain at 100%? If no, why not? | Yes. |