The impact of anxiety, depression, and perceived social support on postoperative pain after hysterectomy

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Scholarly Pursuit and Thesis

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Abstract

Research Question: Do women scheduled for benign hysterectomy who score highly on pre-operative assessment of anxiety, depression, and perceived low social support report higher pain scores after surgery compared to women who are scheduled for benign hysterectomy who score low on pre-operative assessment of anxiety, depression, and perceived low social support?

Background Information: Hysterectomy is a common gynecological procedure that can be done abdominally, laparoscopically, or vaginally, with or without robotic assistance. As with all surgical procedures, chronic postoperative pain is a potential complication. There is a host of factors that can influence post-operative pain, and psychosocial factors are more commonly being identified as risk factors for postoperative pain.

Materials and Methods: In this prospective cohort study, patients scheduled for hysterectomy for benign indications were administered the Patient Health Questionnaire-SADS (PHQ-SADS) and the Multidimensional Scale of Perceived Social Support (MSPSS) surveys to assess their preoperative anxiety, depression, and perceived social support. Patients received a score based on their answers. Patients with severe anxiety and/or depression scores were referred to the appropriate provider and excluded from the study. Intra- operative data was collected retrospectively. Out-patient therapy was standardized, and hydrocodone with acetaminophen was

given. Postoperative pain scores were reported on a scale from 1-10. The scores were gathered by telephone at 1 day, 2 weeks, and 6 weeks postoperatively. This study is continuing to accrue subjects.

Results: Preliminary descriptive statistics demonstrate that 31 women consented to the study of which 24 patients enrolled in the study. The average age is 46±9 and the majority of the population is non-Hispanic black (58%) with at least one prior pregnancy. Approximately two-thirds of the population had a BMI classified as obese. The majority (71%) had somatization (10 or more on PHQ-15), 46% had depression (10 or more on PHQ-9) and 54% had anxiety (10 or more on GAD-7). Data collection is ongoing and will be examined for prediction of anxiety, depression, and perceived low social support for postoperative pain after hysterectomy.

Conclusion: Postoperative pain is a feared complication of any surgical procedure. As the psychosocial factors of pain become better understood, providers will be able to adjust therapy to best suit the needs of each patient. A more complete understanding of mental health effects on post-operative pain can help to guide post-operative therapy. If a patient is found to have a mental health status that is high- risk for postoperative pain, either therapy can be adjusted, or the procedure could be postponed until a more favorable mental health status is attained. A more complete understanding of the relationship between psychosocial factors and pain can help providers deliver the most appropriate, tailored care to each patient.

Research Question

Do women scheduled for benign hysterectomy who score highly on pre- operative assessment of anxiety, depression, and perceived low social support report higher pain scores after surgery compared to women who are scheduled for benign hysterectomy who score low on pre-operative assessment of anxiety, depression, and perceived low social support?

Introduction and Significance

Hysterectomy is one of the most common surgical procedures, with nearly 500,000 operations performed annually in the United States.[1] The procedure can have both benign and malignant indications, and it can be performed abdominally, laparoscopically, or vaginally. The many minimally invasive advancements made over the past decades have helped to improve patient pain scores and overall postoperative outcomes. However, hysterectomy can still be complicated with unforeseen extended post-operative pain. The American College of Obstetrics and Gynecology has developed an Enhanced Recovery After Surgery (ERAS) pathway that appreciates the multi-dimensional nature of pain, which creates the need for a multi-dimensional strategy to optimize postoperative recovery.[2] Much research is currently being done to identify risk factors that can help to predict a patient's postoperative pain outcome, and attention is being paid to the psychological factors at play. Depression, anxiety, and pain catastrophizing can affect the perception of pain, and they have all been indicated in the progression from acute pain to chronic pain.[3,4] Preoperative mental health assessment could help to identify patients at higher risk for postoperative pain complications.

Poor preoperative mental health has been demonstrated to be a predictor of chronic postoperative pain after hysterectomy for benign indications. Depression, anxiety, and pain catastrophizing have all been implicated in worse pain outcomes. A 2017 study out of Germany showed anxiety, depression, and pain anxiety to be risk factors for acute postoperative pain up to three days after hysterectomy.[5] In a 2017 study conducted in China, it was found that preoperative scores of anxiety and depression on the Hospital Anxiety and Depression Scale (HADS) survey correlated with an increased risk of being diagnosed with chronic post-surgical

pain 3 months after hysterectomy.[6] A similar study in 2018 in Portugal demonstrated a positive correlation of anxiety (also measured using HADS) and pain catastrophizing with diagnosis of chronic post-surgical pain at 4 months and 5 years post-hysterectomy.[7] A 2020 study from Singapore measured preoperative anxiety using the State-Trait Anxiety Inventory (STAI) and found a positive correlation with chronic post-hysterectomy pain at 4 months after surgery.[8]

Because these studies were performed in single countries, they lack some external validity. Our study will contribute to the field by including data from the United States. Our study will also build on the foundation of these previous studies by assessing preoperative anxiety and depression using the Patient Health Questionnaire-SADS (PHQ-SADS). In addition, our study will add an assessment of preoperative perceived social support, using the Multidimensional Scale of Perceived Social Support (MSPSS). This particular psychosocial factor has yet to be studied in the context of post-hysterectomy pain. Furthermore, our study is unique in the use of a Numerical Rating Scale (NRS) for the assessment of postoperative pain. The NRS will provide data about the severity of the postoperative pain, which may help to determine the degree to which the psychosocial factors influence pain.

The ultimate goal of identifying risk factors for postoperative pain is prevention and early intervention. High-risk patients could be given additional counseling about postoperative pain expectations, which has been shown to decrease the use of postoperative analgesics.[9] Surgery could even be postponed for patients whose current mental status is unfavorable for uncomplicated post-surgical recovery. In this way, patient care can be optimized and postoperative pain complications can be further minimized.

Materials and Methods

The purpose of this study is to determine whether preoperative anxiety, depression, and low perceived social support are correlated with postoperative pain at 6 weeks after hysterectomy. The study includes English-speaking women over the age of 18, who are undergoing hysterectomy for benign indications. Subjects have been recruited during their preoperative appointments from JPS clinics in Fort Worth and Arlington. Women who agree to take part in the study are walked through the consent process with whichever JPS OB/GYN resident is at the clinic. Upon consenting to the study, subjects leave their name and contact information. Before their operations, subjects are called by telephone and are orally administered the Patient Health Questionnaire-SADS (PHQ-SADS), Multidimensional Scale of Perceived Social Support (MSPSS), and pain scale. Their responses are then documented and scored.

The PHQ-SADS questionnaire includes the Patient Health Questionnaire-9 (PHQ-9), General Anxiety Disorder-7 (GAD-7), and Patient Health Questionnaire-15 (PHQ-15) surveys. The PHQ-9 is a 9-item depression screening in which nine parameters are graded on a 0–3 integer scale, with larger scores indicating greater frequency of a given parameter (symptom).[10] The tool has consistently demonstrated good reliability and validity in primary care settings.[11,12] The total PHQ-9 score for the nine items ranges from 0 to 27 and scores of 5, 10, 15, and 20 represent cut points for mild, moderate, moderately severe, and severe depression respectively.

The GAD-7 is a 7-item anxiety screening which 7 parameters are scored 0 to 3, providing a 0 to 21 severity score. Scores of 5, 10, and 15 represent cut points for mild, moderate, and severe anxiety respectively.

The Patient Health Questionnaire (PHQ-15) is a 15-item somatic symptom scale, by scoring 0 to 2 to the response categories of "not at all" bothered a little" and "bothered a lot". The PHQ-15 scores of 5, 10, and 15 represent cut points for low, medium, and high somatic symptoms severity respectively.[13] The cut off score of 10 was used to determine the proportion with somatization (PHQ-15), anxiety (GAD-7) and depression (PHQ-9).

The MSPSS is a 12-question survey focused on perceived social support from family and friends. For the MSPSS, mean scale score ranging from 1 to 2.9 could be considered low support; a score of 3 to 5 could be considered moderate support; a score from 5.1 to 7 could be considered high support.[14]

Patients with severe anxiety or depression and patients with suicidal ideations are excluded from the study (**Table 1**). If patients are found have severe depression or anxiety, they are referred for Behavioral Health and directed to JPS Psychiatric Emergency Center. If patients are found to have suicidal ideations, the JPS Campus police are notified, and the patient will be evaluated for emergency detention.

Table 1 – Exclusion criteria

Exclusion	Age <18 years Non-English speaking Presence of gynecological malignancy Severe anxiety or depression Suicidal ideation

After hysterectomy, information on hysterectomy type, estimated blood loss, length of surgery, concomitant surgery, days in hospital, complications, and medications are collected through chart review. Outpatient pain is managed with standardized amounts of Hydrocodone and Acetaminophen. If patients are allergic, Tramadol is given instead. Subjects are called and asked to report their pain on a scale 1-10 after 1 day and 2 weeks postoperatively. At 6 weeks post-op, subjects are called and asked to report their pain, and the PHQ-SADS and MSPSS are administered again (**Table 2**). Overall, patients are in the study for approximately 6-12 weeks, depending on the time between recruitment and surgery (**Figure 1**).

Table 2 – Total data elements included in study

Time of Collection	**Data**
Enrollment	Informed consent Name (assigned ID number) Contact Information
Enrollment/Preoperative	Age Demographic (Non-Hispanic White, Non- Hispanic Black, Non-Hispanic Other, Hispanic) Parity BMI Baseline pain score on numerical rating scale from 0-10 (NRS) PHQ-SADS scores (includes PHQ-9, GAD-7, anxiety attacks, PHQ-15) MSPSS score

Intra-operative (collected retrospectively)	Hysterectomy type Blood loss Length of surgery Concomitant surgery Days in hospital Complications Medications
Day 1 post-op	Pain score (NRS)
Week 2 post-op	Pain score (NRS)
Week 6 post-op	Pain score (NRS) PHQ-SADS scores

Written consent forms have been kept by the principal investigator in a locked drawer. Subjects are assigned ID numbers, and a document with the patient's names and ID numbers was kept on a secure drive that only study members are able to access. All collected data has been stored on an Excel file that is also in a secure drive with access only for members of the study. On this Excel file, patient ID numbers are used in place of names. The master document with names and ID numbers will be destroyed at the conclusion of the study.

Pain Score (0-10)
PHQ-SADS
MSPSS

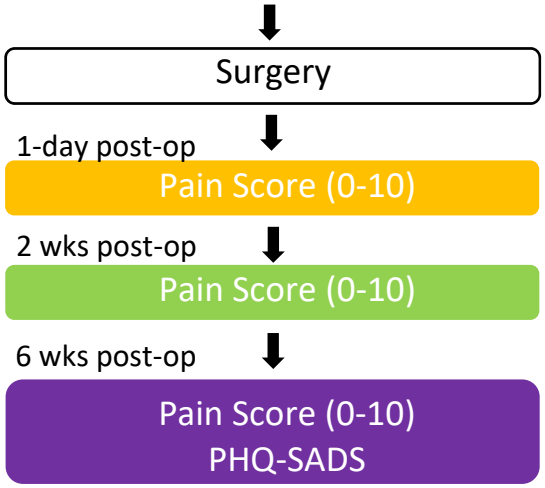

Figure 1 – Timeline of data collection

Descriptive statistics, including mean, standard deviation, median, interquartile range, frequencies, and percentages have been used to describe the preliminary data. Once data collection is complete, mean and median pain scores will be calculated at baseline, two weeks, and six weeks post-hysterectomy. The mean change in pain score will also be calculated from baseline and two and six weeks. A linear regression model on pain scores as a function of anxiety, depression, and perceived social support will be created. Each subject's follow-up pain score will be adjusted according to their baseline pain score to eliminate systemic bias and reduce error variance (e.g. regression to the mean and effects of baseline differences). All models will also be adjusted to age, race and ethnicity, and BMI. Anticipating a 20% drop-out, 130 women will be enrolled for approximately 104 women to complete the follow-up surveys. This sample size will allow for a medium effect size.

Prospectus and protocol drafting was completed in June 2021. At that point, the protocol was submitted for IRB approval. Approval was granted in August 2021, and the first patients were recruited starting that fall. Data collection began with the first patient recruited, and it will continue until 6 weeks after the operation of the final patient. Depending on the timing of their preoperative appointments, patients are typically in the study for 8-12 weeks. As my research mentor is currently the only faculty member who is actively recruiting patients, there is an average recruitment rate of 2 patients/month. At this rate, it will take several additional years to reach the goal enrollment of 130 patients.

Because hysterectomy is one of the most common surgical procedures performed in women in the United States, we anticipated that there would be sufficient women in the JPS clinics who are willing to take part in the study. We had expected the high number of hysterectomy cases to work in our favor. Unfortunately, we did not factor poor patient recruitment. Due to low recruitment, the data collection for the study has not been completed and is still in process. We are hopeful that we may have additional recruiters (either OB/GYN residents or faculty) take part in the project in the future. As data collection has not be completed during my time with the project, it will be continued by another medical student over the next two years. While data collection is not complete, there are 30 women who have completed the study. Preliminary data has been analyzed based on this population.

Results

As of November 30, 2023, there were 31 women consented to the study. Out of the study, 16 (52%) completed the six week follow up. Two women who cancelled the surgery, 3 women who opted out or loss to follow up, and 10 (32%) who have not completed data collection yet. In addition, there were 2 patients that did not have any data collected on the exposure variable, so they will be excluded from the analysis.

Since for the preliminary analysis we focused on reporting the covariates and exposure variables, we will focus on the 15 women who completed the six-week follow-up and 9 who have yet to complete the six-week follow-up. Twenty (20) women completed their surgery by time of analysis.

Table 3 describes the 24 patients enrolled in the study. The average age was 46 years (standard deviation: 9). Majority of the population was non-Hispanic black (58%) with at least one prior pregnancy. Approximately two-thirds of the population had a BMI classified as obese.

Table 4 describes the 20 women who had surgery. Majority of the women had a length of stay for 1 day, with the maximum of 4 days. Majority of the women did not have a complication recorded.

Table 5 describes the exposures of interest in our population. Majority (71%) had somatization (10 or more on PHQ-15), 46% had depression (10 or more on PHQ-9) and 54% had anxiety (10 or more on GAD-7). A third of the population had three of the psychiatric conditions, 25% had two of the three, 21% had one and 21% had none.

Sixty-three (63%) had high level of social support. The mean pain reported at baseline was 6.6 (standard deviation: 2.6), ranging from 0 to 10 (**Figure 2**).

Table 3 - Demographic and Clinical Characteristics of 24 patients enrolled in the study

Characteristic	
Age (mean ± standard deviation)	46 ± 9.0
BMI Category	
Normal	2 (8.3%)
Overweight	6 (25%)
Obese class I	7 (29%)
Obese class II	5 (21%)
Obese class III	4 (17%)
Parity	
None	5 (21%)
1-2	8 (33%)
3 +	11 (46%)
Race and Ethnicity	
Non-Hispanic Black	14 (58%)
Non-Hispanic White	8 (33%)
Other	1 (4.2%)
Hispanic	1 (4.2%)

Table 4 - Additional characteristics of the 20 patients with surgery

Characteristic	
Blood Loss in mL (mean ± standard deviation)	151 ± 99
Blood Loss in mL (median, interquartile range)	113 (75, 200)
Length of stay in days (mean ± standard deviation)	1.5 ± 1.0
Length of stay in days (median, interquartile range)	1 (1,2)
Cystoscopy	
Yes	11 (55%)
No	9 (45%)
Complication	
None	16 (80%)
Yes	4 (20%)

Unilateral Salpingectomy	
Yes	2 (10%)
No	18 (90%)
Bilateral Salpingectomy	
Yes	13 (65%)
No	7 (35%)
Unilateral Oophorectomy	
Yes	1 (5%)
No	19 (95%)
Bilateral Oophorectomy	
Yes	5 (25%)
No	15 (75%)

Table 5 - Distribution of exposures of interest from 24 participants

GAD-7 score	
Minimal (0-4)	6 (25%)
Mild (5-9)	5 (21%)
Moderate (10-14)	5 (21%)
Severe (15-21)	8 (33%)
Anxiety Attack	
Yes	7 (29%)
PHQ-15	
None or mild (0-4)	7 (29%)
Moderate (5-9)	5 (21%)
Moderately Severe (10-14)	8 (33%)
Severe (15-30)	4 (17%)
PHQ-9	
None (0-4)	7 (29%)
Mild (5-9)	6 (25%)
Moderate (10-14)	3 (13%)
Moderately Severe (15-19)	3 (13%)
Severe (20 +)	5 (21%)
MSPSS	
Low	0
Moderate	9 (38%)
High	15 (63%)

Baseline Pain Score (mean ± standard deviation)	6.6 ± 2.6
Baseline Pain Score (median, interquartile range)	7 (5, 8.5)

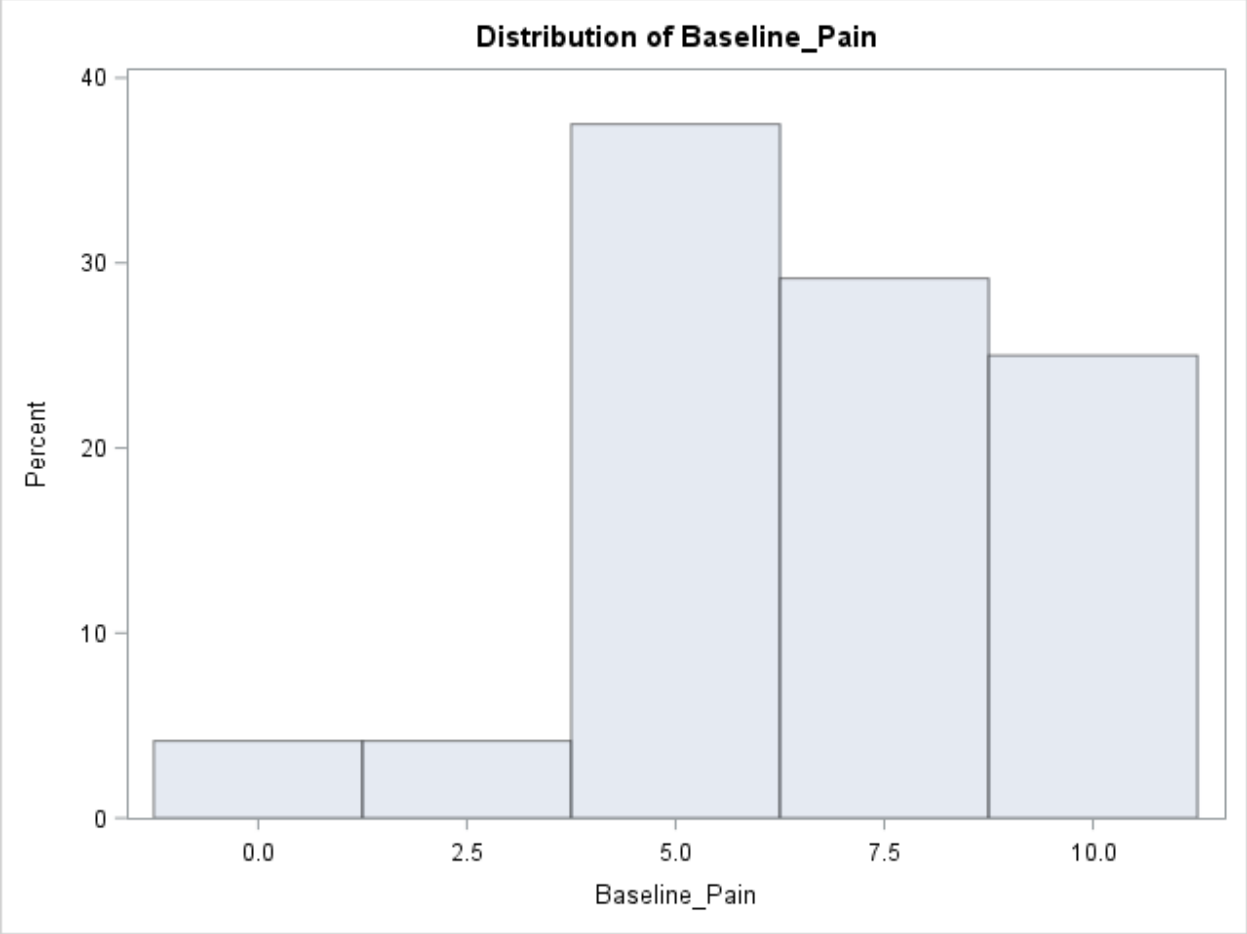

Figure 2 - Histogram of the baseline pain score

Discussion and Innovation

Hundreds of billions of dollars are spent annually in United States to address issues of chronic pain.[15] Because the etiology of pain is multidimensional, stemming from physical, psychological, and social sources, it is difficult to isolate factors that may contribute to its aggravation. The treatment of chronic pain can be a source of frustration to both physicians and patients, with addiction being a dangerous sequela of poorly managed pain. Because long-term pain management is so complicated and expensive, there is a need to create strategies to prevent its development. Although hysterectomy is a surgery that is often undergone for the intent of relieving chronic pain, women can be left with chronic pain. Thus, hysterectomy is a good candidate for studies on the factors that can contribute to postoperative pain.

There is some existing data that focuses on the topic of mental health and post-hysterectomy pain complications, but there has not been such a study conducted in the United States. Because pain is multidimensional, it is likely that cultural factors can influence the perception of pain. For this reason, it is beneficial to add data from the United States to represent an additional culture. In addition, perceived social support is a variable that has yet to be evaluated in regard to its relationship with postoperative pain complications.

The variables of this study, anxiety, depression, and perceived social support, are addressable concerns. If it is found that patients who score high on pre-operative anxiety, depression, or low social support experience higher postoperative pain at 6 weeks, physicians can use the knowledge of the correlation to predict which patients are at high risk for postoperative pain sequela. If physicians can identify these patients, they may receive preoperative counseling or treatment for their anxiety, depression, or low social support.

Additional studies must be conducted to determine if pre-surgical interventions in women with preoperative anxiety, depression, and low social support are successful in lowering postoperative pain. This could be a step toward decreasing the incidence of postoperative pain complications in one of the most common surgical procedures.

This project seeks to shift preoperative evaluation to include mental health status. If a patient's preoperative mental health status is correlated with their risk of developing postoperative pain, the surgeon and patient can consider postponing the surgery until a more favorable mental health is achieved. Future studies must be conducted to determine if preoperative mental health interventions are successful in decreasing the likelihood of postoperative pain complications in at-risk women.

Future Directions

Because this study questions the link between mental health and pain, it could have implications for ideal management of patients with mental health disorders. If it is found that preoperative mental health is a predictor of development of postoperative pain, more research can be conducted to tease out the relationship between the two.

While this study looks at anxiety, depression, and perceived social support, additional mental health parameters that could be studied include sleep, stress, and self-esteem. We hypothesize that poor experiences in these areas could also be associated with higher rates of postoperative pain.

Future directions will also include investigation into interventions that may improve mental health preoperatively. Possible interventions to be studied include regular exercise,

counseling, and group talk therapy. If interventions are found to be successful at improving patient mental health preoperatively, such interventions could be recommended by healthcare providers to surgical candidates to optimize their postoperative outcomes.

Conclusions

It has long been acknowledged anecdotally that mental health is important in the healing process. In recent decades, more data has been published to support this connection empirically. The relationship between mental health and chronic pain is an important one, as it can provide insights in how to predict, prevent, and treat chronic pain in the millions of patients who it affects.

This particular study has been designed to establish the relationship between preoperative mental health and the development of postoperative pain in the specific population of women undergoing hysterectomy for benign indications. Chronic pain, and specifically chronic pelvic pain, can be very difficult to manage. Thus, it is worthwhile to invest in research to predict chronic pain. Additionally, therapies or interventions designed to minimize the risk of chronic pain development should be investigated.

Once data collection has been completed, the data from this project can be analyzed to determine if there is a relationship between mental health and postoperative pain. If the relationship is established, then mental health can be a target for optimization in patients undergoing this surgery. While relevancy may be limited in urgent or emergent surgeries, this connection will be impactful for the planning of elective surgeries. Elective surgeries can allow time for patient optimization through targeted approaches. Possible approaches to improving

mental health that could be the subject of future studies include regular exercise, yoga, meditation, community involvement or volunteering, and social support groups. While improvements in mental health are worthwhile for their own sake, they can have special significance in improving patient surgical outcomes.

Compliance

Due to the inclusion of human subjects, the study requires IRB approval. The study has been approved by the North Texas Regional IRB.

References

1. Cohen SL, Vitonis AF, Einarsson JI. Updated hysterectomy surveillance and factors associated with minimally invasive hysterectomy. *JSLS*. 2014; 18(3).

2. ACOG Commitee Opinion No. 750 Summary: Perioperative Pathways: Enhanced Recovery After Surgery, Obstetricss & Gynecology. *Obstetrics & Gynecology* 2018;132(3):801-02.

3. Nahman-Averbuch H, Nir RR, Sprecher E, Yarnitsky D. Psychological Factors and Conditioned Pain Modulation: A Meta-Analysis. *Clin J Pain* 2016; 32(6): 541-54.

4. Hruschak V, Cochran G. Psychosocial predictors in the transition from acute to chronic pain: a systematic review. *Psychol Health Med* 2018; 23(10):1151-67.

5. Scheel J, Sittl R, Griessinger N, et al. Psychological Predictors of Acute Postoperative Pain After Hysterectomy for Benign Causes. *Clin J Pain* 2017; 33(7): 595-603.

6. Han C, Ge Z, Jiang W, Zhao H, Ma T. Incidence and risk factors of chronic pain following hysterectomy among Southern Jiangsu Chinese Women. *BMC Anesthesiol* 2017; 17(1):103.

7. Pinto PR, McIntyre T, Araujo-Soares V, Almeida A, Costa P. Psychological factors predict an unfavorable pain trajectory after hysterectomy: a prospective cohort study on chronic postsurgical pain. *Pain* 2018; 159(5):956-67.

8. Tan HS, Sultana R, Han NR, Tan CW, Sia ATH, Sng BL. The Association Between Preoperative Pain Catastrophizing and Chronic Pain After Hysterectomy - Secondary Analysis of a Prospective Cohort Study. *J Pain Res* 2020; 13:2151-62.

9. Strom J, Bjerrum MB, Nielsen CV, et al. Anxiety and depression in spine surgery-a systematic integrative review. *Spine J* 2018;18(7):1272-85.

10. Kroenke K, Spitzer RL. The PHQ-9: a new depression diagnostic and severity measure. *Psychiatr Ann* 2002; 32 (9): 509–15.

11. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med* 2001; 16 (9): 606–13.

12. Spitzer RL, Kroenke K, Williams JB. Validation and utility of a self-report version of PRIME-MD: the PHQ primary care study. Primary care evaluation of mental disorders. Patient Health Questionnaire. *JAMA* 1999; 282 (18): 1737–44.

13. Kroenke K, Spitzer RL, Williams JBW. The PHQ-15: Validity of a new measure for evaluating somatic symptom severity. *Psychosom Med* 2002;64:258-266.

14. Zimet GD, Dahlem NW, Zimet SG, Farley GK. The Multidimensional Scale of Perceived Social Support. Journal of Personality Assessment 1988;52:30-41.

15. Gaskin D, Richard, P. The Economic Costs of Pain in the United States. *Institute of Medicine Committee on Advancing Pain Research, Care, and Education,* 2011.