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Risk Factors for Persistent Post-Surgical Pain: Implementation of a Risk Assessment Questionnaire

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Due to the impact of the COVID19 Pandemic, 2020 graduates of the Daniel K. Inouye Graduate School of Nursing were deemed critical to the mission of caring for the health of the nation. All phases of the DNP Project were complete and met the standards and rigors of a quality DNP Project with an abbreviated dissemination timeframe.

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Abstract

Phase II Site

Naval Medical Center Portsmouth

DNP Project Title

Risk Factors for Persistent Post-Surgical Pain: Implementation of a Risk Assessment Questionnaire

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Background or Problem/Issue

Persistent post-surgical pain (PPSP) is a common surgical complication that presents a burden to patients and the health care system. Of all surgical patients, up to 60% are at risk for PPSP. The average annual cost associated with PPSP in 2012 was between $11,846 and $29,617 per patient. Naval Medical Center Portsmouth (NMCP) currently does not have an identification or prevention process for patients at risk for PPSP.

Clinical Question or Purpose

In patients undergoing general or podiatric surgery at Naval Medical Center Portsmouth, does the implementation of a risk assessment questionnaire improve the identification of patients at risk for persistent post-surgical pain, compared to the current practice over a two-month period?

Project Design

The ACE Star Model of Knowledge Transformation was used as the organizing framework for this pre- and post-implementation process improvement project. A thorough review of literature was completed and a risk assessment questionnaire was developed in

consultation with the NMCP chronic pain service. Anesthesia providers and clinic nurses were educated on the significance of PPSP. Provider knowledge and confidence was assessed pre- and post-education. Nurses in the general surgery and podiatry clinics were instructed to provide the questionnaire to all patients with pre-operative appointments. Screening compliance was assessed over a two-month period.

Analysis of the Results

Following education, provider knowledge and confidence improved by 27% ($p<0.001$) and 32.9% ($p<0.001$), respectively. Overall screening compliance was 29.5% with 16 of 87 (18%) patients screening at risk for PPSP. The implementation of a screening questionnaire improved the identification of patients at risk for PPSP when compared to current practice.

Organizational Impact/Implications for Practice

The organizational impact of our project is that NMCP now has a working process to screen patients for PPSP. Pre-operative identification will lead to early intervention and management potentially reducing the incidence and severity of PPSP. Proper identification and subsequent management of patients at risk for PPSP can improve healthcare outcomes, increase patient satisfaction, and decrease cost. These outcomes support the Military Health System Quadruple Aim: increased readiness, better health, better care, and lower cost.

Introduction

The negative effects of post-operative pain can be appreciated in multiple organ systems, most notably the cardiovascular and respiratory systems. It also has the potential to alter an individual's psychological well-being, contributing to a decreased quality of life (Nicholls et al., 2018). Pain causes an increase in sympathetic nervous system stimulation causing the body to release catecholamines resulting in tachycardia and hypertension. Pain induced tachypnea can result in decreased ventilation, perfusion, and atelectasis with the net result of decreased alveolar gas exchange (Nicholls et al., 2018). Schug and Bruce (2017) emphasize that the single greatest risk factor for the development of chronic or persistent post-surgical pain (PPSP) is uncontrolled acute post-operative pain. The literature utilizes the terms chronic and persistent interchangeably to describe this phenomenon.

The International Association for the Study of Pain defines chronic post-surgical pain as "pain developing after a surgical procedure and persisting beyond the healing process," i.e. at least three months after surgery (Schug & Bruce, 2017). The pain is strictly limited to the level or area of nerve innervation that was involved during the surgery and excludes pain caused by other conditions like infection or pre-existing chronic pain syndromes (Schug & Bruce, 2017). At the outset of this project the anesthesia department at Naval Medical Center Portsmouth (NMCP), amidst initiatives in post-operative pain mitigation, did not have a means of identifying at-risk patients via pre-operative screening. Early perioperative recognition and intervention are vital to breaking the progression of PPSP.

Significance of the Problem

Every person undergoing surgery has the potential to have complications such as PPSP, especially since the currently identified risk factors are putative and the exact mechanism of

development speculative (Bruce & Quinlan, 2011). What is without question is that the prevalence of long-term pain resulting from surgery is significant. While the problem has been in the consciousness of researchers for two decades, their efforts have yet to yield a quantitative risk stratification system to aid pre-operative identification and primary prevention, versus tertiary treatment. Research into the development of prolonged pain after, and resulting from, surgery has demonstrated a number of pre-operative risk factors that are more likely to result in persistent and chronic post-surgical pain. For example, Schug and Bruce (2017), place incidence of long-term post-surgical pain for cholecystectomy at 3% - 50%, inguinal herniotomy at 5% - 63%, and for mastectomy and lumpectomy at 11% - 57%. In addition, pre-operative incidence of chronic pain, body mass index greater than 30 kg/m^2, female gender, age less than 40, and presence of mood disorders (depression, anxiety, pain catastrophizing) place patients at greater risk of developing PPSP regardless of surgery type they are undergoing (Webb & Kim, 2018).

To date, NMCP employs no means of attempting to preemptively identify those at higher risk for developing PPSP. Enhanced recovery after surgery protocols (ERAS) exist for specific surgical procedures with known increased prevalence of post-operative complications, including total joint replacements, gynecology/oncology procedures, and colorectal surgeries. The anesthesia department at NMCP currently utilizes risk stratification tools to assess patients pre-operatively for risk factors associated with post-operative nausea and vomiting (PONV) and obstructive sleep apnea (OSA). Our prediction is that thousands of patients with risk factors associated with PPSP are undergoing surgery at NMCP annually without any process in place to identify them pre-operatively or mitigate their risk.

Clinical Question

In patients undergoing general or podiatric surgery at Naval Medical Center Portsmouth, does the implementation of a risk assessment questionnaire improve the identification of patients at risk for persistent post-surgical pain, compared to the current practice over a two-month period?

Focus Areas

Our project has four main focus areas. The first was to identify common risk factors for PPSP through a systematic literature review. In consultation with the chronic pain service (CPS), we narrowed our focus to the most prevalent risk factors applicable to the surgical patient population at NMCP. Anesthesia providers on the CPS are specialists who manage patients who ultimately develop PPSP and are aware of trends in this specific patient population. The second focus area of our project was to develop a pre-operative risk assessment questionnaire based on the results of our literature review. With input from the CPS, our group isolated specific pre-operative risk factors to include in the questionnaire. Because intra-operative or post-operative risk factors found in the literature can not necessarily be screened pre-operatively, they were not included in our questionnaire. Our third focus area was to provide education on the definition, incidence, and evidence-based risk factors associated with PPSP to the anesthesia providers at NMCP and the nurses in the clinic who would be conducting pre-operative patient interviews. Knowledge and confidence was assessed pre- and post-education among the anesthesia providers. Clinic nurses were also educated on the specifics of the risk assessment questionnaire and methods for administering and collecting the questionnaires following completion. The fourth and final focus area for this project was the implementation of our newly developed risk

assessment questionnaire in the general surgery and podiatry clinics and subsequent data collection, over a two-month period.

Relevance to Military Nursing

The central focus of the Military Health System (MHS) Quadruple Aim is increased readiness, supported by the pillars of better health, better care, and lowered cost (Defense Health Agency, 2018). Addressing the problem of PPSP and reducing its prevalence will contribute to improved health, tailored care, and substantial savings in long-term management. Identifying those at risk for PPSP may improve care by allowing early perioperative intervention of post-operative pain. Reduction of PPSP could decrease the expenditures of the MHS by reducing or eliminating the need for long-term pain management. In 2016, the Secretary of Defense enacted policy changes to improve pain management through pain awareness, education, and proactive interventions between patients and interdisciplinary groups of providers. The successful implementation of a pre-operative risk assessment questionnaire would support this directive. Our project aims to increase pain awareness among patients (through screening), providers (through education), administrators and members of our profession (through dissemination of results). Next, we assessed knowledge among anesthesia providers and provide PPSP education to both anesthesia providers and clinic nurses. Lastly, we implemented a preoperative screening process through the joint effort of an interdisciplinary group of healthcare professionals.

At NMCP, nurse anesthetists and pre-operative nurses play a significant role in addressing the incidence of PPSP. These nurses are the surgical patient's first line of defense against perioperative risks. They interview, screen, and consult with providers to arrange for tests to ensure patient optimization prior to surgery. These actions contribute to the early identification of patients with risk factors for PPSP. Once patients are identified as "at-risk",

anesthesia providers may individualize treatment plans and/or initiate consultations with the acute pain service. Acute pain service providers may offer perioperative interventions such as peripheral nerve blocks to minimize acute post-operative pain, a known predictor for PPSP. Reducing the prevalence of PPSP may contribute to cost savings across the organization. Tawfic et al. (2017), estimated the annual cost per patient in the United States during 2012 to be between $11,846-$29,617. Specific patient outcomes, such as lower pain scores, increased satisfaction, and decreased risk of developing PPSP are directly related to these cost savings (Webb & Kim, 2018).

Organizing Framework

We utilized the ACE Star Model of Knowledge Transformation as the framework to organize and guide our evidence-based practice (EBP) project (Figure 1). The Star Model is divided into five stages of knowledge transformation: knowledge discovery, evidence summary, translation into practice, integration into practice, and evaluation (Stevens, 2012). The first stage of knowledge discovery focuses on the review of current literature relevant to the specific clinical question or problem. We performed a comprehensive literature review of the most current evidence to identify known risk factors and types of surgery associated with the development of PPSP. The second stage, evidence summary, is the synthesis of a single statement or idea that summarizes the evidence after a rigorous systematic review. In this phase we performed a literature synthesis and compiled a list of the most prevalent pre-operative risk factors, including types of surgery reported in relation to PPSP. The third stage is translation of evidence into practice, in which we finalized our clinical question and developed a risk assessment questionnaire for pre-operative screening of surgical patients. We also developed an evidence-based educational in-service with a correlating pre-and post-education knowledge and

confidence survey for anesthesia providers. A second educational in-service was developed for clinic nurses in the general surgery and podiatry clinics. The fourth stage of the organizing model is practice integration. The integration of our project consisted of the presentation of our education programs to the anesthesia providers and clinic nurses. We also implemented the risk assessment questionnaire in the surgery clinics for a planned two-month period. The fifth stage, evaluation, reflects the overall impact of the integration on the efficacy and efficiency of care, as well as its influences on an organization's health care policy (White, Dudley-Brown, & Terhaar, 2016). Our primary outcome measure was questionnaire utilization measured in percent compliance over the two-month implementation period. Our secondary outcome measure was pre- versus post-education provider knowledge and confidence scores.

Project Design

General Approach

This project was designed as an evidence-based, pre- and post-implementation process improvement project.

Setting

This project took place in a large, academic, military medical treatment facility that provides care for active duty, retired, and military dependent populations in Southeast Virginia. The hospital performs approximately 10,500 inpatient and outpatient surgeries annually. Anesthesia care is provided by staff comprised of active duty and civilian anesthesiologists and certified registered nurse anesthetists (CRNA). The anesthesia department is home to an Accreditation Council for Graduate Medical Education (ACGME) anesthesia residency program and a nurse anesthesia clinical training site. There is one general surgery clinic staffed by three

registered nurses (RN) performing pre-operative patient evaluations and a single podiatric surgery clinic with one RN performing all pre-operative evaluations.

Procedural Steps

The literature review consisted of comprehensive searches of CINAHL, EMBASE, and PubMed. Search terms included: "persistent post-surgical pain," "persistent post surgical pain," "persistent post-operative pain," "chronic post-operative pain," "chronic post operative pain," "chronic post-surgical pain," "chronic post surgical pain," "preoperative pain," "pre operative pain," "risk," "risk factor," "risk assessment," and "predictor," as well as MeSH terms. Search limits and exclusion criteria were applied and the evidence was systematically appraised.

Our combined database search yielded a total of 384 articles. Our search limits included English only, peer-reviewed, and within the last 10 years (2009-2019). Our exclusion criteria were parturient and pediatric populations, cancer pain (excluding breast cancer surgery due to being a surgical risk factor for PPSP), enhanced recovery after surgery (ERAS) protocols, and intra-operative and post-operative risk factors. After removal of duplicates, we reviewed 300 article titles and abstracts for relevance utilizing the aforementioned criteria. Subsequently, an additional 259 articles were excluded and 41 articles were selected for full-text review. All four members reviewed each article using the Melnyk and Fineout-Overholt model (2011) to assess the quality and level of the evidence (Appendix A). If there was a disagreement on a rating, the rating would be based on a majority vote. Articles were chosen based on relevance to the PICOT and the level of evidence rating. As a result, a total of eight articles were included in our literature appraisal (Appendix B).

For the education of our primary stakeholders, we created a PowerPoint presentation comprised of the results of our literature search including an evidence evaluation and literature

synthesis tables that highlighted the most common evidence-based risk factors associated with PPSP. We concluded the presentation with an introduction to our patient risk assessment questionnaire, an outline of our implementation plan and expected impacts to the department, surgical clinics, hospital as well as the anesthesia profession as a whole. Prior to our education presentation to the anesthesia department, we had attendees take a provider knowledge and confidence survey. The survey consisted of five multiple-choice questions relating to PPSP with corresponding Likert-scale items to evaluate the provider's confidence in their answer choices (Appendix D). We collected demographics from survey participants including: level of education, years of experience and staff/trainee status. Our education of the pre-operative nursing staff in the general and podiatric surgery clinics consisted of project background and objectives, an in-depth explanation of the patient questionnaire, and administrative details for the collection and storage of completed questionnaires over the two-month implementation phase.

Development of the Risk Assessment Questionnaire

Common risk factors for the development of PPSP are well documented in current literature. Through our literature synthesis, we have identified a collective list of pre-operative risk factors that are relevant to our line of clinical inquiry (Appendix C). There have been few attempts to develop a prediction tool for PPSP. Of those created, fewer still have been widely used or sufficiently validated. One research group developed a composite risk index for the development of chronic pain (RICP). They started with 14 risk factors inclusive of the ones identified in our literature review. Their final model of multivariate analysis through logistic regression identified four strong pre-operative predictive factors which had a sensitivity of 74% and specificity of 65% (Althaus et al., 2012). Two factors were related to pre-operative pain and

two factors were psychological in nature: pre-operative pain in the operating field, pre-existing chronic pain, capacity overload, and comorbid stress symptoms.

In a 2018 prospective cohort design study, Mathes et al. validated the original RICP from Althaus et al. and provided a model update. A logistic regression analysis was used to calibrate their updated model as it was further internally validated. The model update led to the inclusion of female sex showing a higher risk for developing PPSP, as well as marital status (Mathes et al., 2018). The new model resulted in a high predictive ability for the development of PPSP.

In order to predict a patient's individual risk of developing PPSP in the pre-operative setting, we used the four-predictor model from the original RICP, omitting the variables which are impossible to identify prior to the patient having surgery. Based on the understanding of our source material, the presence of at least three or more risk factors on our questionnaire was considered a positive screening for an increased risk of developing PPSP. In developing our PPSP risk assessment questionnaire (Appendix E), we also added sex and marital status from Mathes' et al. updated model (2018). Military duty status and rank were also included based on anecdotal evidence provided by CPS providers at NMCP.

HIPAA Concerns

Personally identifiable information (PII) and protected health information (PHI) will not be collected from any patient. There will be no violation of the Health Insurance Portability and Accountability Act of 1996 (HIPAA) during this project's implementation.

Project Results

Of all the patients who had a pre-operative evaluation for surgery in the first month of data collection, the general surgery and podiatry clinics achieved a screening rate of 27.5% (35/127) and 42.9% (15/35) respectively. After minor adjustments to the implementation

process in the second month, the general surgery clinic's screening rate was 25.2% (27/107) and the podiatry clinic's screening rate was 38.5% (10/26). An overall process compliance rate during the two-month implementation period was 29% (87/295). Of the 87 patients who were actually screened, 22.6% (14/62) of the general surgery patients and 8% (2/25) of the podiatry patients had a positive screening, yielding an overall at-risk for PPSP rate of 18%. Demographic data including gender, age, military status, rank, and marital status of the positive screening cohort were collected (n = 16). The mean age of the cohort was 41.3 years and 63% (10/16) of the patients were male. Twelve patients completed the military status, rank, and marital status portion of the questionnaire. Eleven patients reported as being active duty of which 58.3% (7/12) were enlisted, with one enlisted retiree. For marital status, 66.7% (8/12) reported being married.

The mean score of the pre-education provider knowledge assessment was 69.1%. The mean post-education knowledge score improved to 96.2%. The mean score of the overall pre-education provider confidence was 61.3. The mean post-education confidence score improved to 94.2 (Figure 2 and 3). Demographic data of this cohort which included highest level of education, years of anesthesia experience, and staff versus trainee status were also collected (n = 42). Regarding highest level of education, 14.3% (6/42) of the cohort completed a bachelor's degree, 33.3% (14/42) completed a master's degree, and 52.4% completed a doctorate degree. Level of experience was reported as 66.7% (28/42) of the providers having five or less years of anesthesia experience. Greater than five years of anesthesia experience reflected 33.3% (14/42) of providers. The mean years of anesthesia experience was 6.1 years with 42.9% (18/42) of the providers reported to be either an anesthesia resident or student registered nurse anesthetist.

Analysis of the Results

The primary outcome measure of our project was the compliance rate of pre-operative screening in the general and podiatric surgery clinics at NMCP over a two-month period. Between the two clinics, 295 patients were seen for a pre-operative interview. We received 87 completed questionnaires with 21 missing at least one demographic data point. The process we implemented returned a 29.5% compliance rate. From a retrospective analysis of process barriers and shortcomings we were able to identify several causative factors for the relatively low process compliance. Namely, the delivery of our questionnaire was predicated on the ability and willingness of clinic nurses to participate. Initially, after educating the nurses regarding the purpose, significance, and goals of our process implementation to identify these at-risk patients, we received positive feedback about the importance of the issue and strong assurances regarding the feasibility of the planned implementation in their respective clinics. Unfortunately, these nurses were already under significant production pressure, without incentive to participate, and free from reprimand or consequence for lack of participation. In order to closely track compliance, we collected the completed questionnaires from the nurses at the end of each work week. In addition, we solicited their feedback regarding the logistics of the process. Specifically, the feedback we received was that the workflow had been changed, resulting in a lower process compliance than initially anticipated. Therefore, in an attempt to alleviate the impact on their workflow and improve process compliance, we placed the responsibility of distributing the questionnaires with the unit secretary after the first month. We continued to monitor the success of the project on a weekly basis, but unfortunately compliance still did not improve. The feedback we were given after the final month of process implementation was that there were variations in staffing at the check-in desk without appropriate communication of our

implemented process. Due to the initial perceived buy-in from the clinic nurses, our group did not feel it was necessary to involve the clinic leadership at the outset of the project. In hindsight, clinic leadership may have increased accountability among the clinic nurses to more thoroughly engage the process. Although we only had minimal representation with a returned 29% compliance rate in two out of the 17 surgical clinics at NMCP, we were still able to identify patients at risk for PPSP.

Our secondary outcome measure was the difference in pre- and post-education provider knowledge and confidence scores. We received a total of 42 provider knowledge assessments. Five providers did not complete the confidence score portion of the assessment. Therefore, 37 providers were included in the analysis. Utilizing the Wilcoxon Signed Rank test revealed a statistically significant improvement of both overall provider knowledge and confidence scores by 27% ($p<0.001$) and 32.9% ($p<0.001$) respectively. These results were indicative of the effectiveness of our provider education.

Organizational Impact/Implications to Practice & Policy

This EBP project successfully identified patients with risk factors for PPSP thru a pre-operative screening questionnaire. In addition, it led to a significant improvement in the knowledge and confidence among primary stakeholders related to clinical details of PPSP. Prior to this project, NMCP lacked a process to identify and/or manage patients at risk for PPSP. These results revealed a population that may be prevalent and underserved among patients undergoing surgery at NMCP. Early identification of patients at risk for developing PPSP allows for individualized anesthetic plans, improving perioperative outcomes. Improved healthcare outcomes translate to decreased cost. Based on the relatively low compliance with the

implemented screening process it is difficult to quantify the significance of PPSP and its implications on our organization.

Future Directions for Research and Practice

Although current literature indicates PPSP is a statistical certainty among the surgical population, we cannot fully demonstrate the extent of this at NMCP. In order to increase compliance rates, future projects must focus on a different point in patient throughput to implement the questionnaire. A possible solution could be to incorporate the PPSP questionnaire into the pre-operative document packet constructed weeks in advance of the clinic visit. We also recommend involvement of each surgery clinic's leadership in order to enforce staff accountability. Once an optimal strategy for increasing compliance rates of pre-operative screening for PPSP is achieved, future implementations of the risk assessment questionnaire across all surgical clinics within an MTF should be considered.

Once screening has been reliably established with higher compliance, patients identified as at-risk should be tracked post-operatively in an effort to assess for the presence of pain in both the acute and chronic phases of their recovery. According to the literature, the highest predictor of PPSP development is uncontrolled pain in the immediate post-operative period (Mathes et al., 2018). The three to six-month window marks the point in disease progression where lingering pain meets the definition of PPSP. By tracking patients to the six-month mark, correlation of risk factors to occurrence of PPSP would be possible. Furthermore, sensitivity, specificity, and predictive ability of the risk assessment questionnaire could be validated by future researchers. Finally, additional research can explore multimodal anesthetic/analgesic techniques to lessen the development of PPSP. Current evidenced-based interventions in the literature include:

preoperative education and psychological preparation, low dose ketamine and other atypical analgesics such as lidocaine, magnesium, and gabapentinoids (Levy, Mills, & Rockett, 2019).

Conclusion

This project resulted in positively identifying surgical patients at risk for PPSP through the administration of a screening questionnaire. Despite the low compliance rate displayed in our results, we now have a working process to screen patients for PPSP at our organization which may help uncover this underserved population. The implementation of the project did encounter some challenges such as increased workload for clinic nurses, production pressure without incentive to comply, and lack of leadership enforcement. Ultimately, these limitations hindered our ability to determine the scale of our clinical problem and the prevalence of the issue of PPSP in our organization. Further improvements on the implementation of the questionnaire are needed for the authors to recommend that anesthesia departments across the MHS consider the implementation of this PPSP questionnaire. With respect to the educational component of this project, the improved provider knowledge and confidence scores showed the effectiveness of our educational presentation.

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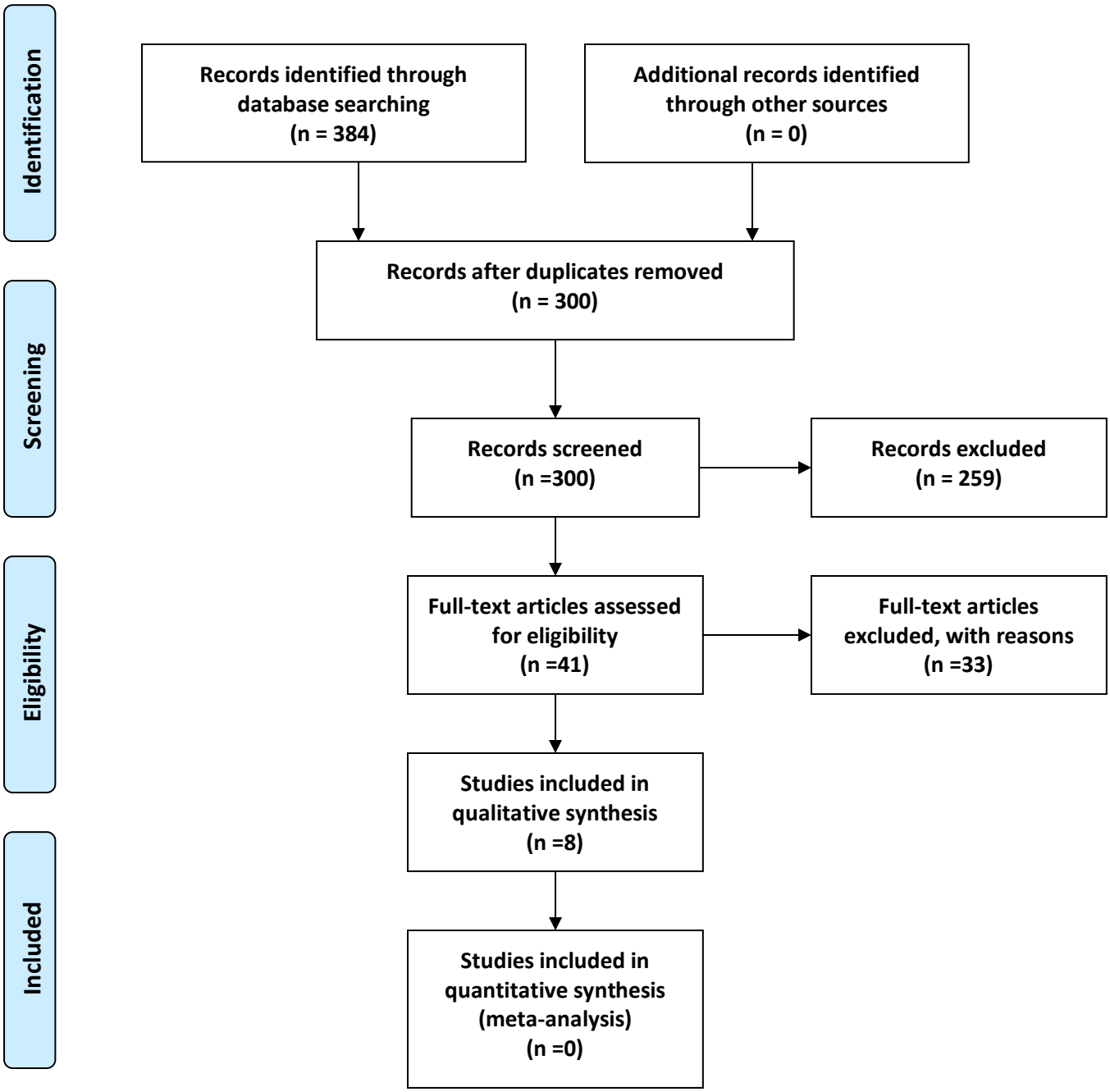
Appendix A: Evidence Synthesis Table

Citation	Relevance to PICOT	Design Type	Sample / Size	Outcome Variables & Definitions	Measures	Analytical Approach	Risk Factors	Limitations	Evidence Rating/ Level of Quality
Author (year)	+ to ++++	RCT	Characteristics, N, attrition, etc.	IV = DV =	Instrument or tool used	Statistical tests appropriate	Identified risk factors	Convenience Sample	I / A
Althaus et al. (2012)	++++	Systematic review, risk Index	150	N/A	N/A	Data compilation	• Capacity overload (psychological risk factors) • Preop pain in operative field • Chronic preop pain • Comorbid stress symptoms	Conflicting results on preop anxiety excluded, no consideration for type of surgery, small sample size	V/A
Bruce et al. (2014)	++++	Prospective cohort study	359	N/A	N/A	Mann-whitney U and X^2 test	• Younger age • Women • Acute postop pain		VI/A
Katz, J., & Seltzer, Z. (2009)	++++	Systematic Review	15 studies included: sample sizes range from 23 to 1048	N/A	N/A	N/A	• Types of surgery (hernia repair and breast surgery)	Authors cite a lack of control for pts with preop central sensitization, genetic factors, and different outcome measures between anesthesia research and psychological research on the same subject; the author includes his own research in the articles reviewed	V/A

Theunissen, M. (2012)	++++	**Systematic Review and Meta-Analysis**	**29 articles included in review**	**IV=Pre-operative anxiety and catastrophizing DV=PPSP**	**STATA version 11.2**	**Chi-Square tests**	• **Pre-operative anxiety (catastrophizing)** • **Pre-operative pain**	**Heterogeneity in the measurement and reporting of predictors, in outcome measures, and in statistical analyses make the comparison of results difficult.**	**V/A**
Van Rijckevorsel, D. (2015)	++++	**Review**	**11 Articles**	**IV=Risk Factors for PPSP DV=PPSP**	**N/A**	**N/A**	• **Risk Factors: younger age, female, depression, anxiety, pain catastrophizing, preexisting pain, breast surgery, inguinal hernia repair, and pre-operative use of opioids**	**N/A**	**V/A**
VanDenKerkhof, E. G. (2013)	++++	**Systematic Review**	**15 articles**	**IV= Risk Factors for PPSP DV=PPSP**	**Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials as a framework**	**N/A**	• **Younger age, sex, education, marital status, socioeconomic status, lifestyle factors (such as smoking), presence and duration of pre-operative pain, and pain catastrophizing are risk factors for PPSP. Mixed evidence for sex, employment status, marital status, workers compensation, height, weight, and body mass index (BMI). Depression, anxiety, and higher pre-operative anxiety or surgical fear increase PPSP.**	**Limited by the fact that current evidence about risk factors for CPSP are mostly derived from small samples of surgical patients from single centers (often with <100 patients) and, therefore, may not necessarily report the most important putative risk factors.**	**V/A**

Wang, L. et al. (2018)	++++	**Meta-Analysis of RCTs**	**15 RCTs, Total N=2200**	**IV= Cognitive Behavioral Therapy** **DV= post-op pain and degree of physical impairment**	**GRADE approach to appraise quality of evidence** **Conversion of all pain metrics to 0-10 cm VAS (Visual Analogue Scale) for comparison** **X^2 and I^2 to examine heterogeneity of pooled analysis**	**Yes**	• **Perioperative psych intervention (cognitive behavioral therapy, relaxation therapy) reduces PPSP** • **No significant difference to "usual care" with periop education and development of PPSP**	**Inconsistent/incomplete/inadequate information reported on components of psychotherapy; different types of surgery in RCTs;**	**I/B**
Wang, Y. et al. (2018)	++++	**Prospective Cohort Study**	**N= 259**	**IV= Pre-surgery pain beliefs, beliefs about long-term effects of surgery** **DV= Acute and Chronic Post-Surgical Pain**	**Bivariate Correlation Analysis**	**Yes**	• **Higher pre-surgery concerns about long-term effects of surgery proved more at risk for higher PPSP at 4 month follow up, independent of demographics, surgery duration, of type of surgery**	**Majority of patients were undereducated, middle age females either undergoing cholecystectomy or hysterectomy; no control or analysis of patients previous encounters/experiences with surgery; no ambulatory/out-patient surgeries included**	**IV/B**

Appendix B: Literature Review (PRISMA)



Appendix C: PPSP Risk Factors Table

-Herniorrhaphy -Mastectomy	-Pre-operative pain in the operating field -Preexisting pain -Other chronic pre-operative pain -Younger age -Female -Depression -Pain catastrophizing -Capacity overload -Psychological distress -Comorbid stress symptoms (sleeping disorder, exhaustion, sleeping or sedation medications, frightening thoughts, dizziness, tachycardia, feeling misunderstood, trembling hands) -Anxiety

Appendix D: Pre- and Post-Education Provider Knowledge Assessment

Pre- and Post-Education Provider Knowledge Assessment

For each of the following multiple-choice questions, please select the most correct answer AND then indicate the level of confidence with which you made your selections for questions 1-7.

1. Persistent postsurgical pain (PPSP) is best described as pain following a surgical procedure that lasts _____?
a) less than 3 months
b) greater than 3 months
c) less than 2 weeks
d) greater than 2 weeks

0% 10 20 30 40 50 60 70 80 90 100%

No Confidence Moderate Confidence Complete Confidence

2. Which of the following surgeries is associated with an increased incidence of PPSP?
a) Herniorrhaphy
b) Panniculectomy
c) Craniotomy
d) Tonsillectomy

0% 10 20 30 40 50 60 70 80 90 100%

No Confidence Moderate Confidence Complete Confidence

3. Which of the following risk factors is most predictive for PPSP?
a) Male gender
b) Presence of preoperative chronic pain
c) BMI > 30
d) Anxiety

0% 10 20 30 40 50 60 70 80 90 100%

No Confidence Moderate Confidence Complete Confidence

4. True or False. PPSP is a common surgical complication.
a) True
b) False

0% 10 20 30 40 50 60 70 80 90 100%

No Confidence Moderate Confidence Complete Confidence

5. True or False. PPSP is a burden to both the patient and the healthcare system.
a) True
b) False

0% 10 20 30 40 50 60 70 80 90 100%

No Confidence Moderate Confidence Complete Confidence

6. Highest level of education? _____

7. Number of years of experience in anesthesia? _____ Staff____ Trainee____

8. Have you completed any of the following fellowships? Circle all that apply.
a) Acute pain management
b) Chronic pain management
c) Pediatrics
d) Cardiothoracic
e) Obstetrics
f) Other? _____

Appendix E: Risk Assessment Questionnaire

Today's Date_____ Date of Surgery _____

USU Nurse Anesthesia Program
Naval Medical Center Portsmouth Clinical Site
Persistent Postsurgical Pain Risk Assessment

Please fill in the blank or circle the appropriate answer to each item below. Once complete, please return survey to the clinic nurse.

Circle One: Active Duty Reservist Retired Military Dependent

If Active Duty, enter Rank:_____

1. What is your gender? Female ☐ Male ☐
2. What is your age? _____
3. Marital Status? Married Single Separated Divorced
4. What surgery are you having? _____
5. Have you suffered pre-op pain in the part of the body being operated on? Yes ☐ No ☐
6. Have you suffered from pre-op pain in any other area of your body besides the area being operated on (i.e. chronic headaches, neck/back pain, joint pain etc.)? Yes ☐ No ☐
7. In the past six months, have you experienced any of the following symptoms?
   a. sleep disturbances Yes ☐ No ☐
   b. exhaustion Yes ☐ No ☐
   c. frightening thoughts Yes ☐ No ☐
   d. dizziness Yes ☐ No ☐
   e. increased heart rate/palpitations Yes ☐ No ☐
   f. trembling hands Yes ☐ No ☐
   g. feeling misunderstood Yes ☐ No ☐
8. Have you suffered from capacity overload/overstrain in the past 6 months? Yes ☐ No ☐

CITI Certificates

CITI PROGRAM

Completion Date 30-Aug-2017
Expiration Date 29-Aug-2020
Record ID [redacted]

This is to certify that:

Larry Beasley

Has completed the following CITI Program course:

OUSD P&R Human Research (Curriculum Group)
Biomedical Investigators and Research Study Team (Course Learner Group)
1 - Biomedical Investigators (Stage)

Under requirements set by:

Office of the Under Secretary of Defense (Personnel and Readiness)

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?wf3a665f4-04d0-4042-9ddb-099ef3503e46-24373564

CITI Certificates

CITI PROGRAM

Completion Date 30-Aug-2017
Expiration Date 29-Aug-2020
Record ID [redacted]

This is to certify that:

Jean-frederick Blais

Has completed the following CITI Program course:

OUSD P&R Human Research (Curriculum Group)
Biomedical Investigators and Research Study Team (Course Learner Group)
1 - Biomedical Investigators (Stage)

Under requirements set by:

Office of the Under Secretary of Defense (Personnel and Readiness)

CITI
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CITI Certificates

CITI PROGRAM

Completion Date 28-Aug-2017
Expiration Date 27-Aug-2020
Record ID [redacted]

This is to certify that:

Raephael Garcia

Has completed the following CITI Program course:

OUSD P&R Human Research (Curriculum Group)
Biomedical Investigators and Research Study Team (Course Learner Group)
1 - Basic Course (Stage)

Under requirements set by:

Office of the Under Secretary of Defense (Personnel and Readiness)

Verify at www.citiprogram.org/verify/?wec1bbcc5-8bce-499e-b091-baf7fa536da6-24341417

CITI Certificates

CITI PROGRAM

Completion Date 29-Aug-2017
Expiration Date 28-Aug-2020
Record ID [redacted]

This is to certify that:

Keenart Tio

Has completed the following CITI Program course:

OUSD P&R Human Research (Curriculum Group)
Biomedical Investigators and Research Study Team (Course Learner Group)
1 - Biomedical Investigators (Stage)

Under requirements set by:

Office of the Under Secretary of Defense (Personnel and Readiness)

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w4bfd5ba5-9265-49d4-a788-4e3547ca839f-24347029

Figure 1: ACE Star Model of Knowledge Transformation

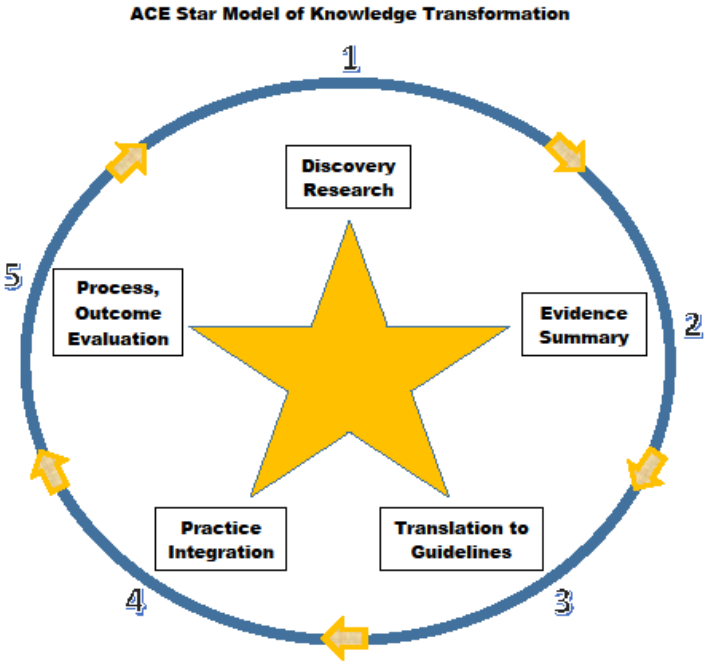


Figure 2: Pre and Post Knowledge Assessment Score

	Pre-assessment	Post-assessment	Change (Post - Pre)
Mean	69.19	96.22	27.03
Median	60	100	20
Std. Deviation	21.91	9.24	24.14
Std. Error of Mean	3.60	1.52	3.97

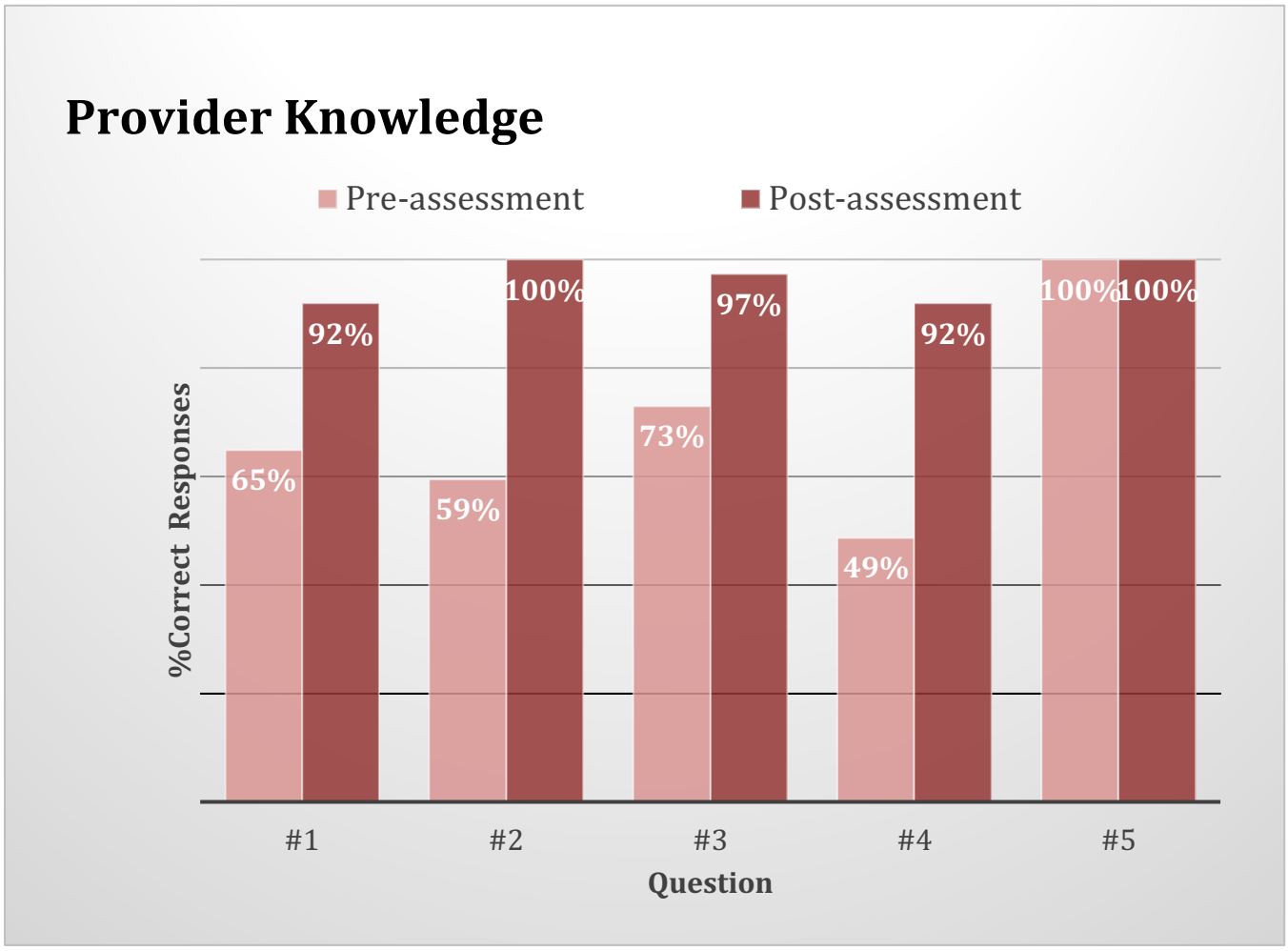
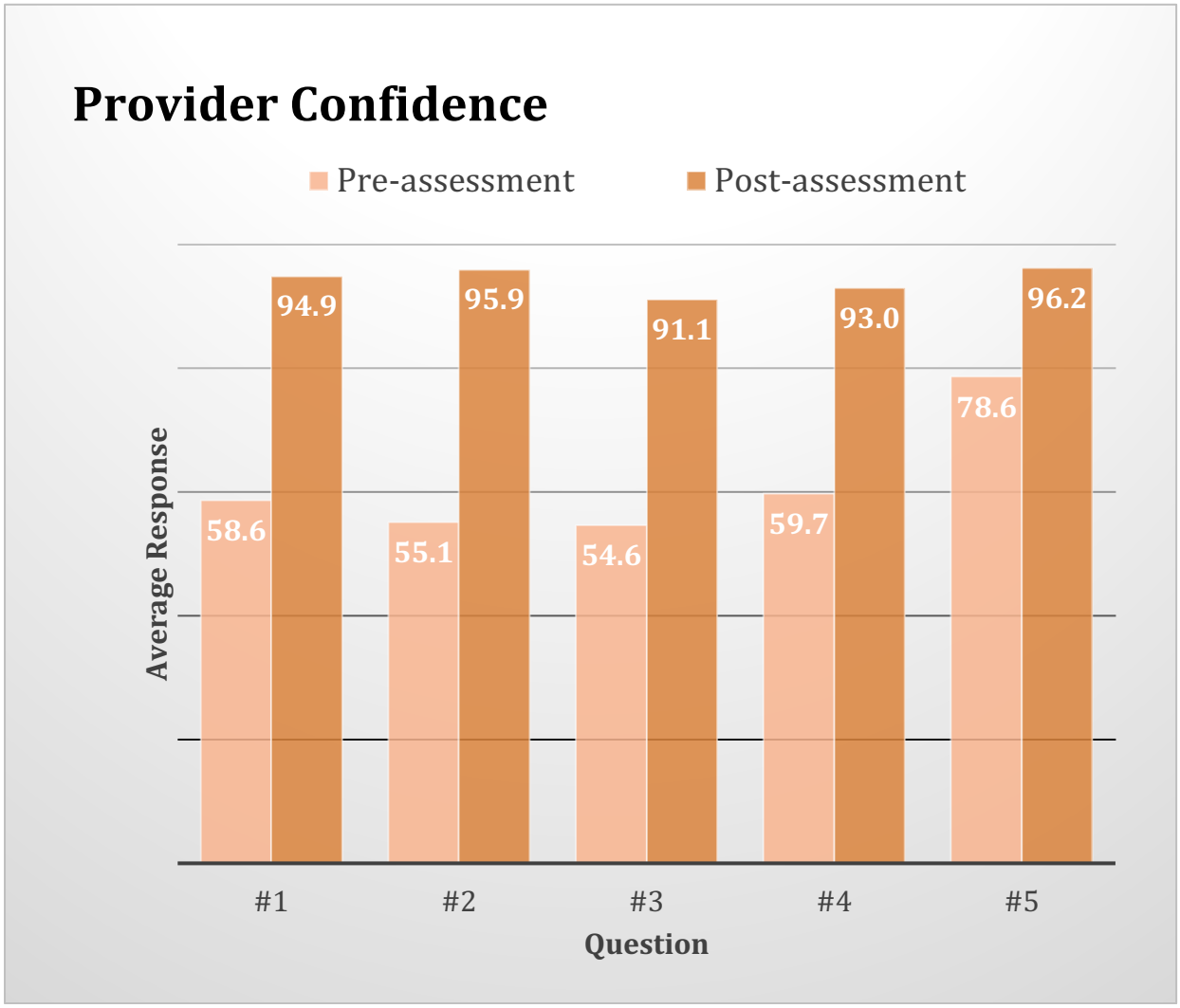


Figure 3: Pre and Post Question Confidence Scores

Pre-CI #1	Post-CI #1	Pre-CI #2	Post-CI #2	Pre-CI #3	Post-CI #3	Pre-CI #4	Post-CI #4	Pre-CI #5	Post-CI #5
58.65	94.86	55.14	95.95	54.59	91.08	59.73	92.97	78.65	96.22
50	100	50	100	50	100	50	100	100	100
24.40	16.27	25.34	14.23	23.76	18.68	21.66	16.48	28.40	12.33
4.01	2.67	4.17	2.34	3.91	3.07	3.56	2.71	4.67	2.03



USU Form 3202N

USUHS FORM 3202N
DANIEL K. INOUYE GRADUATE SCHOOL OF NURSING
EVIDENCE-BASED PRACTICE/PERFORMANCE IMPROVEMENT PROPOSAL

VPR Date Stamp

Project Number: _____ (VPR will assign)

Project Title: Implementation of a Screening Process for Risk Factors of Persistent Postsurgical Pain

SECTION A: STUDENT POC INFORMATION

1. Name (Last, First, MI): Blais, Jean-Frederick, Student E-mail: jean-frederick.blais@usuhs.edu
2. Home Address: [redacted]

SECTION B: COMMITTEE CHAIR / SENIOR MENTOR INFORMATION

3. Name (Last, First, MI): Rucker, Micheal T.
4. Telephone: 606-224-5864 Fax: E-mail: michael.rucker@usuhs.edu
5. USUHS Building/ Room No.:

SECTION C: PROJECT INFORMATION

6. Attach the Abstract for the proposal, including the following sections: Site Location of the Project, Title, Authors, Background or Problem/Issue, Clinical Question/Purpose, Project Design, Anticipated Organizational Impact/Implications for Practice and also include the Proposed Timeline. Single space the abstract and use Times New Roman font, size 12.
7. Is this proposal related to an active research project of the Chair/Senior Mentor identified in Section B? ☐ Yes ☒ No
   If yes, complete below; if no, proceed to Part 8.
   Project Number: _____
   Project Title:
   Project Start Date: _____ Project End Date: _____
8. Anticipated period of performance: Project Start Date: 1/2/2018 Project End Date: 5/20/2020
9. Performance Site(s): Naval Medical Center Portsmouth Virginia
10. Does this project involve any classified information? (Contact the USUHS Security Office for guidance) ☐ Yes ☒ No
11. Do you have a funding source for this project? ☐ Yes ☒ No ☐ NA
    If yes, specify the funding agency and the amount provided:

SECTION D: SIGNATURES

The following signatures attest to the validity of the above information:

BLAIS.JEANFREDERICK.[redacted]
Student (Project Point of Contact for t[redacted]e)

RUCKER.MICHAEL.TODD.12[redacted]
Chair/Senior Mentor

BONDS.RAYMOND.L.[redacted]
7
Chair/Program Director

[redacted]te)
Chair/Program Director

WANZER.LINDA.JEANNE.[redacted]
DNP Project Director or PhD Directo[redacted]te)

SEIBERT.DIANE.C.[redacted]
Associate Dean for Academic Affa

WASSERMAN.JOAN.E[redacted]
Associate Dean for Research, GSN (Signature and Date)

ROMANO.CAROL.A.[redacted]
Dean, DKI Graduate School of Nursing (Signature and Date)

In light of the above signatures, the project is approved.

[redacted]
USUHS Vice President for Research

2 July 2019
Date

USUHS Form 3202N (VPR) - Revised Sep 2015 v1.2
Previous versions are obsolete

MTF IRB/PI Letter of Determination

Clinical Investigation Department, Naval Medical Center Portsmouth

620 John Paul Jones Circle, Portsmouth, VA 23708 (757) 953-5939 Fax (757) 953-5298, DSN 377-5939

Thomas S. Rieg, PhD
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Kersten N. Wheeler, MS
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Division Head,
Research Subjects Protection

June G. Brockman, BA
Division Head,
Research Resources

Joanna E. Fishback, DVM
Major, VC, USA
Division Head,
Laboratory Animal Medicine

26 June 2019

From: Deputy, Clinical Investigation Department
To: LT Jean-Frederick Blais, NC, USN; LT Larry Beasley, NC, USN; LT Raephael Garcia, NC, USN; LT Keenart Tio, NC, USN

SUBJ: LETTER OF WAIVER OF IRB REVIEW FOR PROGRAM EVALUATION/QUALITY IMPROVEMENT PROJECT

1. Your project titled, "NMCP.2019.0076: Implementation of a Screening Process for Risk Factors for Persistent Post-surgical Pain (PPSP)" does not require IRB review. Navy policy states that these types of program evaluation projects are exempt from IRB review.

2. Projects that do not require IRB approval are not eligible for Clinical Investigation Department travel funds.

3. You will still need to obtain publication approval for the project which is required for all works presented or published outside of NMCP.

4. I remain available and may be reached at (757)953-5939.

Kersten Wheeler
K. N. WHEELER

PAO Clearance for archiving final reports to "USU Archives"

DNP Project Completion Verification

Appendix G: Daniel K. Inouye Graduate School of Nursing
DNP Project Completion Verification Form

DOCTOR OF NURSING PRACTICE PROJECT
Completion Verification Form

The DNP Project titled: Risk Factors for Persistent Post-Surgical Pain: Implementation of a Risk Assessment Questionnaire was completed at Naval Medical Center Portsmouth by the following student(s):

(type student name)	*(signature)*	*(date)*
Larry Beasley, BSN, LT, USN	[redacted]	1 APR 2020
Jean Blais, BSN, LT, USN		1 Apr 20
Raephael Garcia, BSN, LT, USN		01APR2020
Keenart Tio, BSN, LT, USN		01 APR 2020

The DNP Practice Project Team verifies that the following components of the DNP project, accomplished by the above students, is of sufficient rigor and demonstrates doctoral level scholarship to meet the requirements for USUHS GSN graduation:

- Presentation of DNP project to the leadership/stakeholders at the Phase II Site,
- Abstract/Impact Statement (*Appendix F*), and
- DNP Project written report.

Verified by:

(type name)	*(signature)*	*(date)*	
Michael Rucker, DNP, LCDR, USN	[redacted]	01APR2020	Senior Mentor
Lauren Suszan, DNP, LCDR, USN		01Apr2020	Team Mentor & Phase II Site Director

For RNA Students only - add the following additional signature for final verification of project completion:

Kennett Radford, PhD, CDR, USN
RNA Project Director *(type name)*

[redacted] *(Signature)*

7 APR 2020 *(Date)*

Form Version: 26 Aug 2017