PAIN MANAGEMENT OF BUPRENORPHINE PATIENTS IN THE PERIOPERATIVE SETTING

by

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ABSTRACT

Background: Buprenorphine is an FDA-approved medication for the treatment of opioid use disorder and a useful tool in helping patients recover from opioid addiction. Due to the mechanism of action of buprenorphine on opioid receptors, treatment of acute pain in the perioperative setting can be challenging. Local problem: At the facility site, buprenorphine patients who present for surgery have a longer average length of stay in the post-anesthesia care unit (PACU). Nurses also expressed a need for further education and increased proficiency in caring for buprenorphine patients. Methods: The purpose of this project was to increase staff communication, provide specific education to staff about buprenorphine, and decrease the length of stay for buprenorphine patients in the PACU. Interventions: This project involved the implementation of three interventions. The first intervention involved adding chart documentation of buprenorphine status, allowing for notification to the operating room and PACU staff. The second intervention was the initiation of improved communication between the preoperative department and the PACU. The third intervention was an educational presentation and reference sheet that was provided to the PACU staff. Results: After implementation, 80% of buprenorphine patients had a note in their chart alerting the OR and PACU staff of their buprenorphine status, however direct communication between departments only occurred for 20% of patients. 100% of PACU staff nurses reported increased proficiency in caring for buprenorphine patients after education implementation. Conclusion: The QI project resulted in increased staff proficiency and interdepartmental communication, indicating improved care for buprenorphine patients in the perioperative setting.

CHAPTER ONE

REVIEW OF THE LITERATURE

Introduction

Opioid use disorder (OUD) is a devastating public health issue that is currently one of the leading causes of preventable mortality in the U.S., affecting an estimated 2.5 million people (Kohan et al., 2021). In response to this epidemic, medications like Buprenorphine are increasingly prescribed to assist patients in the treatment of OUD, decrease the risk of opioid overdose, and achieve long-term recovery (Substance Abuse and Mental Health Services Administration [SAMHSA], 2021). Combining medication with psychosocial counseling and behavior modification has led to improved patient outcomes including increased treatment retention and decreased mortality (Kohan et al., 2021). As helpful as buprenorphine is for assisting patients with OUD, it presents a unique challenge for pain and medication management when patients using buprenorphine require a surgical intervention.

Background and Significance

The challenge of treating patients on Buprenorphine in the perioperative setting is related to its mechanism of action. Buprenorphine acts as a partial mu-opioid receptor agonist, binding to opioid receptors but producing less activation than full agonists, leading to reduced opioid cravings and withdrawal symptoms (Kumar et al., 2013). It also can prevent other opioids from fully binding to receptors, blocking their analgesic and euphoric effects, and therefore discouraging abuse (Buresh et al., 2019). Buprenorphine possesses a ceiling effect, meaning the level of effects of the drug such as analgesia, euphoria, and respiratory depression will reach a

maximum point and plateau, instead of increasing linearly like other opioids (SAMHSA, 2021). Although useful for the treatment of opioid use disorder, buprenorphine presents a challenge for pain management in patients undergoing surgical procedures, as full mu-opioid agonists commonly used for post-operative pain control such as hydromorphone, morphine, and fentanyl are blocked from working as effectively as they are partially blocked from receptors by buprenorphine (Kohan et al., 2021).

As the presence of buprenorphine makes other opioid medications less effective, patients taking buprenorphine require preoperative planning and education. Unfortunately, there is a lack of consensus on the best approach to prepare these patients for surgery. The main issue centers on whether patients should taper off their buprenorphine before surgery, allowing for the clearance of their mu-receptors and providing for increased efficacy of opioid medications for acute pain control, or continue their buprenorphine dose throughout the perioperative period (Ward et al., 2019). This issue is compounded by a lack of education on best practice for the treatment of these patients among nursing and medical staff in the hospital and the absence of a published guideline for the best way to manage these patients' pain (Martin et al., 2019a). Previously, the federal government required prescribers to submit a Notice of Intent and receive a registration number to prescribe buprenorphine (SAMHSA, 2023). This waiver program also limited the number of patients to whom each provider could prescribe buprenorphine (SAMHSA, 2023). However, the recent signing of the Consolidated Appropriations Act of 2023 removed these requirements, making it easier for prescribers to provide buprenorphine to patients struggling with opioid use disorder (SAMHSA, 2023). With this change in prescribing

regulations, the number of patients using buprenorphine for opioid use disorder is predicted to increase (Davis, 2023).

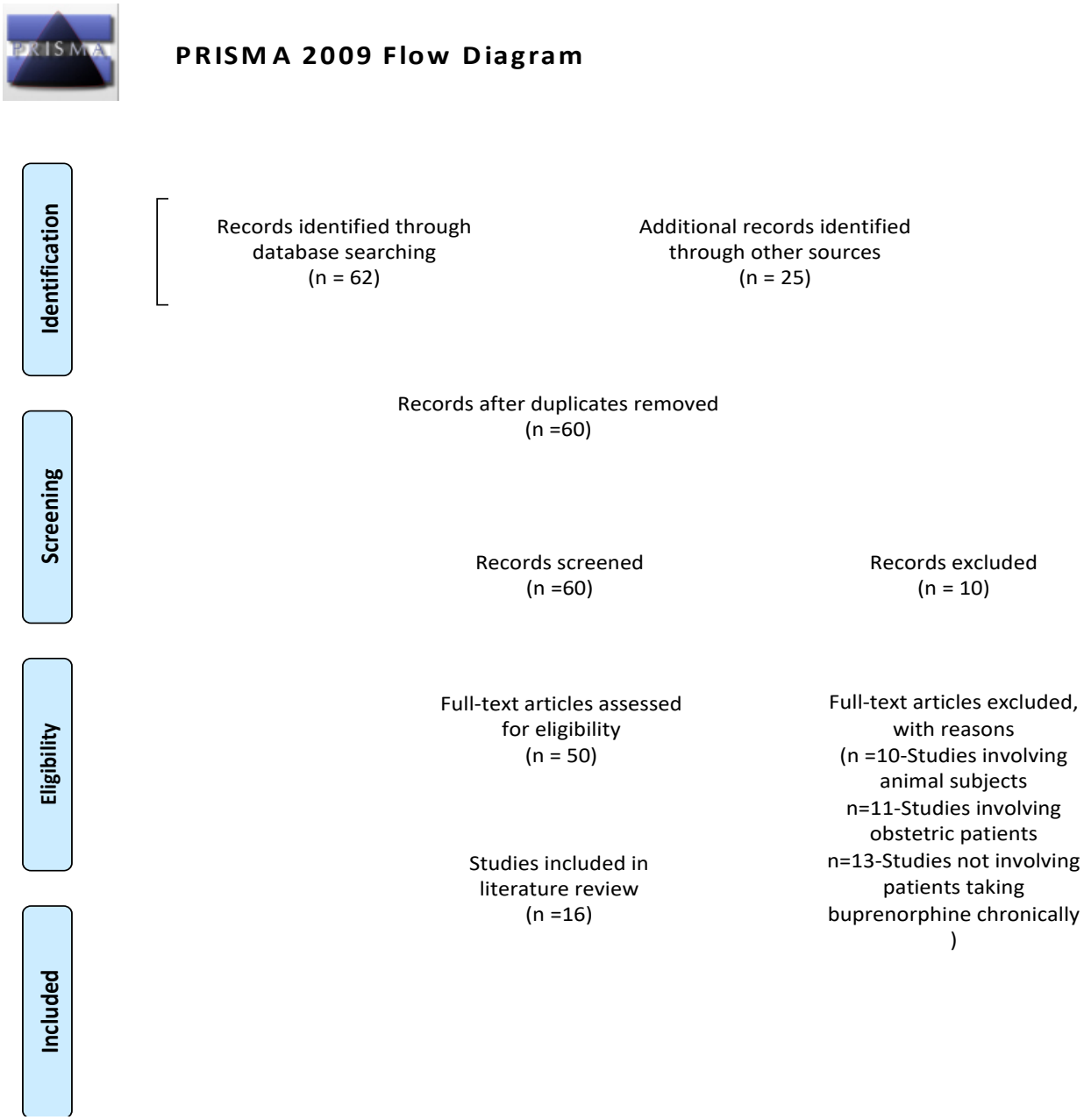
Increased education, improved workflow, and communication between departments is imperative for the management of buprenorphine patients in the perioperative period. These improvements will streamline the treatment process, provide for adequate pain management throughout the hospital stay, and increase patient satisfaction. To support the development of these interventions a literature review was necessary to review current evidence-based recommendations and to identify any research gaps where further research is warranted.

Methods

The literature review served to research current practice recommendations for managing buprenorphine patients in the perioperative setting. A search was conducted using the following databases: CINAHL, Pubmed, and Web of Science. Databases were searched in September of 2023 and utilized the search terms buprenorphine, suboxone, perioperative, preoperative, postoperative, surgical, pain management, and pain control. The search was limited to articles published since 2013, written in English, and available in full-text format. The initial search produced 87 articles. After excluding editorials, theses or dissertations, study protocols, and duplicates, 50 full-text articles were screened for eligibility by reading the title and abstract. 16 studies were selected for the literature review. Other full-text articles were excluded due to using animal subjects, research involving solely obstetric patients, and studies that focused on buprenorphine as a pain medicine to be given in acute settings, not in patients with chronic use before surgery. The articles that met the inclusion criteria consist of 7 retrospective studies, 2 matched cohort studies, 6 systematic reviews, and 1 clinical practice advisory. The strength of

the research found was limited by the lack of randomized control trials and the small sample sizes used in many of the studies referenced. However, the inclusion of 6 systematic reviews helps to provide a comprehensive overview of the available research.

Figure 1. PRISMA Flow Diagram



Maintaining Buprenorphine Dose Throughout the Perioperative Period

As buprenorphine occupies receptors utilized by pain medications often given during a surgical procedure, patients have previously been advised to wean off their buprenorphine before their surgery to allow the medication to clear their system before their procedure. Recent research suggests that this approach may be harmful to patients by potentially triggering a relapse and requiring a transition to short-acting opioid agonists (Sharp et al., 2021; Ward et al., 2018). It may also increase anxiety and cause unneeded stress for patients who may already be worried about undergoing a surgical procedure (Ward et al., 2018). Upon discharge from the hospital, patients may be prescribed only full opioid agonists such as oxycodone, which necessitates a reintroduction of buprenorphine and may trigger a relapse of their opioid use disorder (Buresh et al., 2020). Several research studies support maintaining patients on their buprenorphine dose through their day of surgery and hospital stay, finding that it decreases the chance of relapse, may decrease the number of postoperative opioids needed for pain control, and does not prevent adequate analgesia (Attaar et al., 2021; Buresh et al., 2020; Goel et al., 2019; Kohan et al., 2021; Quaye & Zhang, 2019). Furthermore, adequate pain control is achievable without changing or discontinuing patients' buprenorphine doses even when undergoing surgeries with higher rates of postoperative pain (Sharp et al., 2021).

Patients who did not receive their regular dose of buprenorphine postoperatively and were placed on patient-controlled analgesia devices required significantly higher doses of medication for longer periods compared to patients who maintained their buprenorphine dose (Macintyre et al., 2013). Additionally, patients who were continued on their home dose and were given buprenorphine immediately postoperatively had a significantly lower opioid requirement

throughout their hospitalization, including in the post-anesthesia care unit (PACU), on the inpatient and floor and at discharge, when compared to patients who stopped taking their medications preoperatively (Schuster et al., 2022).

Some studies found that both patients who were weaned off their usual buprenorphine dose and those who continued their medication struggled with pain control in the hospital setting, suggesting no advantage to preoperative discontinuation (Martin et al., 2019a, Mehta et al., 2020, Wyse et al., 2022). Other studies noted that patients who maintained their buprenorphine dose up to their day of surgery may still require higher doses of pain medications postoperatively when compared to patients who are opioid naïve or not using chronic opioids before surgery (Hansen et al., 2016, Martin et al., 2019b). However, some studies found that patients taking buprenorphine had similar pain medication requirements in the first 48 hours postoperatively as patients who were not on buprenorphine (Vogler et al., 2021).

Following a Protocol

The use of an algorithm or protocol for managing the perioperative care of buprenorphine patients is another approach supported by research. The plan of care for patients can be decided based on the type of surgery, and the amount of buprenorphine the patient is taking preoperatively (Jonan et al., 2018; Quaye & Zhang, 2019). Recommendations for continuing buprenorphine throughout the perioperative setting acknowledge that further research studies to ascertain the optimal preoperative dose need to be explored (Kohan et al., 2021; Quaye & Zhang, 2019). For patients who are taking doses of buprenorphine higher than 16mg daily and will undergo surgery that may cause moderate to severe pain, tapering down to 16mg may be beneficial as it will prevent the patient from withdrawing from buprenorphine but allow receptor

availability for the perioperative period (Jonan et al., 2018; Quaye & Zhang, 2019). The patient may then receive a maintenance buprenorphine dose of 8mg while they are in the hospital and receiving additional opioids, and then return to their usual dose once they have been discharged from the hospital (Quaye & Zhang, 2019). If the decision is made to hold buprenorphine before a surgical procedure that has an intermediate to high risk of postoperative pain, it can be held up to 5 days before the procedure allowing for a decrease in the plasma blood levels of buprenorphine thus allowing other opioids to have a stronger action for pain control (Jonan et al., 2018).

Use of Multi-Modal Pain Approach

Whether patients continue their buprenorphine dose throughout the perioperative period, utilizing a multi-modal approach to pain control may be beneficial and reduce the overall amount of opioids given in the perioperative period (Buresh et al., 2020; Goel et al., 2019; Jonan et al., 2018; Sharp et al., 2021; Ward et al., 2018). Non-opioid medications such as NSAIDS, acetaminophen, gabapentinoids, ketamine, and lidocaine can be very beneficial for pain control as they do not act on opioid receptors yet can provide supplementary analgesia (Buresh et al., 2020; Goel et al., 2019; Jonan et al., 2018; Sharp et al., 2021; Ward et al., 2018). The use of regional anesthesia such as regional or neuraxial blocks should also be considered, especially in surgeries with a higher incidence of severe postoperative pain such as orthopedic surgeries, as they have been shown to provide adequate pain management in the immediate postoperative period (Buresh et al., 2020; Goel et al., 2019; Jonan et al., 2018; Sharp et al., 2021; Ward et al., 2018).

Patient Education and Team-Based Approach

The process of undergoing surgery while taking buprenorphine can be complicated, confusing, and anxiety-producing for patients. Pre-operative planning, education, and collaboration between the patient, prescribing physician, and hospital team can help to alleviate unnecessary stress on the patient (Ward et al., 2018). Devising a plan for pain management before the procedure can help reassure the patient and reduce the chance of severe pain during the perioperative period (Ward et al., 2018). In addition to monitoring and treating pain during the inpatient period, symptoms of withdrawal, cravings, or anxiety surrounding relapse should also be considered and addressed by the care team (Ward et al., 2018).

Collaboration between the prescribing physician and the hospital care team is of utmost importance in providing appropriate care for patients taking buprenorphine (Kohan et al., 2021; Ward et al., 2018). If patients will be discharged from the hospital with additional opioid prescriptions, instructions on safe use and proper disposal must be provided (Ward et al., 2018). Additionally, patients who will be restarting or returning to their preoperative dose of buprenorphine should be counseled on this transition and seen by their prescribing provider as soon as feasible post-discharge (Ward et al., 2018).

Practice and Policy Implications

The evidence gathered from the literature review overwhelmingly supports continuing a patient's buprenorphine dose throughout the perioperative period with the ability to reduce or alter a patient's dose depending on the type of surgical procedure they undergo. Developing a plan through collaboration between the prescribing physician, the patient, and the surgical team will help to ease preoperative anxiety and reassure the patient that a plan is in place to manage

their pain and surgical recovery. Improved documentation and communication between departments will ensure that patients are treated with an individualized approach depending on their current buprenorphine dose and their proposed surgery and decrease uncertainty about the plan of care. Improved education of the staff will provide for better pain management, improved staff satisfaction, and a decrease in the length of stay for buprenorphine patients in the postoperative period. Patient satisfaction scores may also be increased through better communication, decreased pain scores, and improved discharge planning.

Conclusion

Perioperative management of patients taking buprenorphine for opioid use disorder is a complex issue that needs to be further researched to ascertain the best practice for maintaining pain control throughout the hospital stay and minimizing the risk of post-discharge relapse. The intricacies of buprenorphine's mechanism of action necessitate the creation of a plan for pain control that includes a patient-centered, multi-modal approach. Improved communication, education, and additional workflow steps remain the best plan for improving the care of this vulnerable population.

CHAPTER TWO

QUALITY IMPROVEMENT PROPOSAL

Introduction

Opioid use disorder affects individuals worldwide but is especially prevalent in the United States where it is considered an epidemic. Nationwide, opioids are responsible for 75% of drug-related overdoses, and deaths related to drug overdoses have seen an increase in recent years reaching a new record in 2022 (CDC, 2023; Mann, 2023). In Montana, opioid abuse is one of the main causes of drug overdose deaths, causing 35% of all overdose deaths in the state (Montana Department of Health and Human Services, 2023). In 2021, Montana hospitals spent over 5 million dollars providing care related to opioid-related injuries (Montana Department of Health and Human Services, 2023). The devastating effects of the opioid epidemic have led to increased prescribing of medications approved for the treatment of opioid use disorder such as buprenorphine. The use of buprenorphine may contribute to improved patient outcomes including decreased mortality, treatment retention, improved quality of life, and lower rates of abuse (Barreveld et al., 2023). Buprenorphine can also be used for chronic pain management, offering a safer option than traditional opioids, with a lower chance of overdose, and decreasing euphoric feelings that can trigger addictive behaviors (Barreveld et al., 2023).

Although buprenorphine is a great resource for the treatment of opioid use disorder in the outpatient setting, it poses a challenge to the safe medical management of patients in the inpatient setting, especially those who are undergoing a surgical procedure (Barreveld et al., 2023). These patients require a specialized plan of care and a collaboration between providers,

nursing staff, and pharmacy services to prevent a relapse or setback in the patients' addiction recovery. A lack of knowledge and experience in caring for patients who are prescribed buprenorphine often contributes to poor pain management postoperatively (Barreveld et al., 2023). Therefore, patients using buprenorphine are a vulnerable population who require additional support and individualized plans of care to ensure a smooth process during the perioperative and postoperative recovery period.

Problem Statement

The problem in the setting where this quality improvement project will be implemented, is that a lack of education and a breakdown of communication between departments contribute to the mismanagement of buprenorphine patients who present for a surgical procedure. As suggested by multiple research studies on perioperative management and pain control for patients prescribed buprenorphine, the creation of a protocol can be a useful tool to prepare both patients and staff for their time in the hospital (Jonan et al., 2018; Quaye & Zhang, 2019). Collaboration between members of the care team including the prescribing physician, preoperative staff, anesthesia providers, pharmacy, post-operative care staff, social work, and the care management team is also imperative to providing individualized care to this vulnerable patient population (Barreveld, et al., 2023). This QI project will seek to improve the current workflow in the perioperative area at the facility, increase communication between the various departments involved in preparing and caring for patients receiving buprenorphine and undergoing a surgical procedure, and increase staff education about the proper treatment and pain management for this vulnerable population.

Organizational Microsystem Assessment

Management of pain after a surgical procedure is an important part of nursing care in the postoperative and inpatient unit at the setting for this QI project. At the facility setting there are several protocols and order sets in place for managing pain for patients in the general population, however a specific plan for patients with a higher opioid tolerance because of their home medications or because they use an opioid partial agonist like buprenorphine, is lacking. Preoperative nursing staff is tasked with providing education to patients prescribed buprenorphine on how to prepare for surgery, but do not give specific instructions about effective buprenorphine dosing. These instructions are provided by the prescribing provider and may vary based on the patient's history and dose and the provider's preference. Postoperatively, patients usually stay in the post-anesthesia care unit (PACU) for an average length of stay of 40 minutes when other circumstances such as inpatient bed availability are controlled. However, based on chart review and reports from nursing staff, patients taking buprenorphine preoperatively remained in the PACU for significantly longer periods due to intractable pain. The lack of a specialized order set, nursing education, or preplanning for the care of these patients all contribute to longer lengths of stay in the PACU, higher pain scores in recovery, and increased stress on the staff and patient. Patients who remain in the PACU for longer than average disrupt the flow of patients from the operating rooms to the PACU and can lead to an operating room hold, where patients are finished with their surgical procedure but must remain in the operating room due to lack of space in the PACU. As the operating rooms are the most expensive area of the hospital, delays in the flow of patients from the operating area to the recovery area are costly (Van Winkle et al., 2016).

Involved stakeholders for this QI project include prescribing physicians, preoperative staff, anesthesia providers, PACU nurses, inpatient pharmacy, floor nurses, and inpatient management. The project site is located in a city that serves as a healthcare hub for several surrounding smaller cities and towns and also provides trauma and surgical care for individuals from neighboring states. Recent national data on the number of patients using buprenorphine is not available, however as of 2019 1.7 million individuals were said to be receiving a buprenorphine prescription in the U.S. (National Institute on Drug Abuse, 2021). In Montana 625 individuals were prescribed buprenorphine as of 2019, a number that has likely increased after the removal of the X waiver requirement in March of 2023 (SAMHSA, 2020). At the site the total number of individuals using buprenorphine who visited the hospital in the year 2023 is unknown, however, 700 doses of buprenorphine were administered to patients during their hospital stay in 2023 at this institution.

Quality Improvement Model

This project was guided by the Institute for Healthcare Improvement's (IHI) Quality Improvement Essentials Toolkit. Based on the Model for Improvement, the IHI's toolkit provides resources for quality improvement in healthcare guided by the Plan-Do-Study-Act (PDSA) cycle (Institute for Healthcare Improvement [IHI], 2023). The PDSA cycle provides a method for testing changes implemented during a quality improvement project, first the change is planned, then it is implemented on a trial basis, the results of the change are observed and collected and then the change is altered or continued based on what was learned during the cycle (IHI, 2023). For this project, a fishbone diagram (Appendix A) was initially created to examine root causes that contributed to poor management of buprenorphine patients in the perioperative and inpatient

setting. A flowchart based on the IHI's toolkit to track the process that occurs as a patient progresses through the perioperative stages was also utilized to identify possible areas of improvement. The PDSA cycle will be used as a guide for the implementation of the QI project. The planning stage involves meeting with stakeholders, conducting a system assessment through tools such as the fishbone diagram to identify root causes, developing the educational tools to be presented to staff to improve the management of care of buprenorphine patients, and developing the schedule for the implementation of the project. The "do" step of the cycle will involve providing education to staff and introducing new steps of the workflow such as improved communication between departments. The "study" step will involve collecting a survey from PACU nurses on the education they received and its effectiveness in improving their proficiency, collecting data from patients' charts, and recording data in an Excel spreadsheet. The final step, "act" will involve meeting with stakeholders and reviewing collected data, altering or providing additional education to staff based on survey results, and adding additional interventions for future improvements based on what was learned during the cycle (IHI, 2023).

Specific Aims/Purpose Statement

The purpose of this quality improvement initiative is to improve patient care for a vulnerable population, patients using buprenorphine, by improving staff education and communication. The ultimate goal of this project is to improve pain management for buprenorphine patients during their hospital stay by increasing staff education and communication. Short-, intermediate-, and long-term SMART goals will be used to measure progress towards the project goal. The short-term goal will be for all pre-admission nurses to provide instructions and support to each buprenorphine patient before they report to the hospital,

including documentation of each patient's specific instructions for buprenorphine dosing as instructed by their prescribing provider, and documentation that they completed the additional workflow step of notifying the PACU charge nurse that a patient taking buprenorphine will be having surgery. Another short-term goal is for 75% of post-operative nursing staff to receive education on caring for buprenorphine patients after a surgical procedure and be provided a handout that they can reference when caring for patients taking buprenorphine. The mid-term goal will be for at least 75% of the PACU nursing staff to report improved proficiency in providing care for buprenorphine patients after implementation of the buprenorphine patient care guide, and PACU staff members to achieve an average of 80% or higher on a quiz about best practice for care of patients using buprenorphine. The long-term goal will be for 75% of patients using buprenorphine to have a length of stay in the PACU of less than one hour.

Methods

Implementation Summary

The intervention will take place in the perioperative units of a 286-bed hospital located in a middle-sized city that provides local, state, and regional care. The hospital is operated by a nonprofit regional health system with facilities in seven states. The perioperative units include the preoperative planning area, the pre-surgery unit, the 14 operating rooms, and the Post Anesthesia Care Unit (PACU) which has 12 bays. The perioperative units care for an average of 41 surgical cases per day. The focus of the implementation will be the nursing staff in the preoperative unit and the PACU, and patients who take buprenorphine regularly before presenting for a surgical procedure. The implementation will focus on workflow change, namely

documentation and notification, and staff education over four months in the perioperative areas of the facility.

Intervention and Implementation

The proposed project will involve the implementation of staff education and improved communication between departments. Creating a process change for how patients on buprenorphine are cared for in the hospital starts with the education and instructions provided to them by the nurses who work in the preoperative area. These nurses call patients before their scheduled surgery date to provide them with instructions to prepare for surgery. The first step in this quality improvement initiative will be to implement a new step in the nursing workflow where preoperative nursing staff specifically document that the patient is on buprenorphine in the surgical notes portion of the patient chart in the electronic health record (EHR). As discussed previously, current evidence supports patients continuing their home buprenorphine dose up to the morning of their surgery and does not suggest weaning completely from their dose due to the risk of relapse (Kohan et al., 2021). Specific instructions for individual patients will originate from the prescribing physician, however, it will be useful to have the patient's plan of care as provided by the prescribing physician documented in the patient chart before the day of surgery. Currently, when a patient taking buprenorphine meets with the preoperative nurse, the nurse then notifies their charge nurse, the pharmacy, and anesthesia. The PACU charge nurse however is not notified which can lead to a breakdown in communication regarding the patient's status. Adding a notification to the PACU charge nurse will help the PACU prepare for this patient and create nursing assignments conducive to improved and appropriate care. Therefore the nurse caring for the buprenorphine patient will provide one one-on-one care to properly manage post-

operative pain judiciously. This specific workflow process is further outlined in Appendix B.

The next step will be to improve the education of the PACU nurses and provide them with a quick reference guide for use when taking care of buprenorphine patients in the PACU. An educational presentation during the staff meeting in January will introduce the guide and offer time for questions to be answered. This guide (Appendix C) will then be placed in the education binder located on the unit for easy reference for nurses when they provide care to a buprenorphine patient. This guide is developed by the DNP student through assistance from the in-hospital pharmacist. The final step will be the collection and analysis of data including the dissemination of a survey to PACU staff on the utility of the educational reference sheet, chart review of documentation from the preoperative nursing staff, and chart review of the length of stay of buprenorphine patients.

Potential barriers to implementation may include staff resistance to changing their current workflow or receiving new education, staff not attending the staff meeting, or receiving the education promptly. As the project will involve the addition of steps in the current workflow for the preoperative nurses and will require them to provide new information in their documentation and notification of an additional staff member, staff buy-in from the preoperative nurses will be required to meet the first goal. Also, patients who take buprenorphine are a specific and small population, and it is impossible to anticipate the number of patients who will have surgery and be cared for by the perioperative team during the project. This may make measuring patient outcomes difficult or result in a small number of patients from which to gather data. However, measuring the improved education and proficiency of the staff will serve as a preliminary appraisal that can be applied to future patients.

Evaluation and Analysis

The evaluation of the first short-term goal will be conducted by performing a chart review one month after implementation and three months after implementation. A report will be run of each buprenorphine patient who underwent a scheduled surgical procedure during the period and a tally will be collected to measure the percentage of patients who have a note in the surgical notes portion of the chart and confirmation of notification to the remainder of the care team, specifically the PACU charge nurse. The goal at 1 month will be for 75% of patients to have a note with these specificities in their chart, and for 100% completion at 3 months after the intervention is initiated. Measurement at one month, allows the DNP student to check progress towards meeting the designated goal. The DNP student can then meet with the preoperative nurses and troubleshoot any issues that may be hindering the completion of the note on each patient, thereby allowing for an opportunity to provide further guidance or education as needed.

The second short-term goal will be measured using a read-and-sign document that will be placed in the PACU staff room that is used by all PACU staff nurses. After the education on this initiative is provided to the staff at a staff meeting in January 2024, staff will be asked to read over the brief reference sheet and sign a form stating that they read and understood the document. This will increase the chances of all staff receiving the education as those who are not present at the staff meeting will be able to read the information sheet on their own time during a shift. In addition, the DNP student will be able to readily see which staff members of the PACU team have not signed, and meet with them individually to achieve 100% compliance. Staff that sign the document will be considered to have received the education, and staff will have two weeks after the staff meeting in January 2024 to read and sign the document. The signed

document will then be collected by the DNP student and provided to the unit manager as documentation of the completed education.

The mid-term goal will be measured by a survey that will be provided to staff via email one month after the initial education is received. This survey, which will be created using an online survey software will measure the PACU RN staff's level of perceived confidence in their ability to care for patients who are prescribed buprenorphine as categorized by "not proficient, somewhat proficient, and very proficient." Each survey question will use a scoring system in which not proficient will be worth one point, somewhat proficient two points, and very proficient three points. The survey responses will be scored and averaged by the DNP student and compared to the goal of 75% of staff nurses reporting "very proficient" as their level of competency in providing care to buprenorphine patients. There will also be five quiz questions that will measure actual proficiency and retention of education with a goal of a score of 80% or higher for all nurses who complete the survey.

The long-term goal will be measured at the end of March 2024 through a chart review of every buprenorphine patient who recovered in the PACU. The DNP student together with a pharmacist will run a report using the electronic chart system to identify every buprenorphine patient that was treated during the project timeframe. The DNP student will then collect the data on the number of minutes the patient spent in the PACU (which is charted for billing purposes on every patient who receives care in the PACU). Data collected will be organized on a spreadsheet with patients deidentified using a numbering system (i.e. patient 1, patient 2, etc.). The data collected will be how many minutes the patient spent in the PACU, and whether they received

buprenorphine while in the PACU. The average number of minutes spent in PACU will be calculated and then reported.

Safety and Confidentiality

The confidentiality of patients whose data is collected will be protected by deidentifying each patient by using a numerical system to categorize the patient anonymously. No identifying data such as type of surgery, provider, or date of service will be collected. Charts will be viewed by the DNP student on-site on a facility-protected computer and actual patient charts will not leave the facility. Names of staff who may be included in staff surveys will be omitted in the final reporting of the data, and surveys will be deidentified once the data from them is collected. There are no foreseen risks to patients or staff who will participate in this QI project. This project is supported by management, pharmacists, staff nurses, and anesthesiology. This project was approved by multiple nursing managers and the PACU RN educator, and a site representative form was signed. The primary data collected will be survey responses from PACU staff nurses which will be collected by the DNP student. All other data will be secondary and collected using reports and chart reviews of the electronic health record. Identified data will not be removed from the clinical site and any aggregation of the data which will all be deidentified will be stored on a password-protected computer that will only be accessed by the DNP student.

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CHAPTER THREE

QUALITY IMPROVEMENT MANUSCRIPT

Contribution of Authors and Co-Authors

Manuscript(s) in Chapter(s) 1

Author: Kate Ella Hildner

Contributions: Design and implementation of the project, drafting and final revisions of the manuscript

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Contributions: Committee member, manuscript editing

Manuscript Information

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☐ Published in a peer-reviewed journal

Abstract

Background: Buprenorphine is an FDA-approved medication for the treatment of opioid use disorder and a useful tool in helping patients recover from opioid addiction. Due to the mechanism of action of buprenorphine on opioid receptors, treatment of acute pain in the perioperative setting can be challenging. Local problem: At the facility site, buprenorphine patients who present for surgery have a longer average length of stay in the post-anesthesia care unit (PACU). Nurses also expressed a need for further education and increased proficiency in caring for buprenorphine patients. Methods: The purpose of this project was to increase staff communication, provide specific education to staff about buprenorphine, and decrease the length of stay for buprenorphine patients in the PACU. Interventions: This project involved the implementation of three interventions. The first intervention involved adding chart documentation of buprenorphine status, allowing for notification to the operating room and PACU staff. The second intervention was the initiation of improved communication between the preoperative department and the PACU. The third intervention was an educational presentation and reference sheet that was provided to the PACU staff. Results: After implementation, 80% of buprenorphine patients had a note in their chart alerting the OR and PACU staff of their buprenorphine status, however direct communication between departments only occurred for 20% of patients. 100% of PACU staff nurses reported increased proficiency in caring for buprenorphine patients after education implementation. Conclusion: The QI project resulted in increased staff proficiency and interdepartmental communication, indicating improved care for buprenorphine patients in the perioperative setting.

Clinical Problem

Opioid use disorder was declared a public health emergency in 2017 by the U.S. Department of Health and Human Services and continues to increase in severity, affecting over 2.5 million Americans (Barreveld et al., 2022). The prescribing rate for opioids in Montana was 1.5% higher than the national average in 2019, with 48.2 opioid prescriptions written for each 100 individuals. (CDC, 2023b). Due to the increase in opioid use disorder numbers, the utilization of medications specifically designed to treat opioid use disorder, such as buprenorphine, is also on the rise (Schuster et al., 2022). Buprenorphine, an FDA-approved medication for the treatment of opioid dependence, is a partial mu opioid receptor agonist and a kappa opioid receptor antagonist, meaning it binds to opioid receptors and provides analgesia like opioids, but has a lower chance of causing respiratory depression and euphoria, limiting its' abuse potential (Barreveld et al., 2022). Buprenorphine's mechanism of action at the opioid receptor sites means it can interfere with common medications given as anesthesia during the operative period, and has led to controversy as to the appropriate way to manage postoperative pain for patients who take it regularly (Quaye and Zhang, 2018).

At the implementation site, patients who were prescribed buprenorphine and then presented for a surgical procedure were found to have a longer than normal length of stay in the post-anesthesia care unit (PACU). The staff had not received any additional education on the management of pain in patients using buprenorphine and were unaware of available resources to improve patients' pain control. The resulting increase in length of stay interrupted the flow of patients from the operating room through the recovery area and caused additional stress to the nursing staff and patients.

Literature Review

Despite a previous lack of consensus on how best to manage buprenorphine patients in the perioperative period, research shows that maintaining patients on their home buprenorphine dose up to the day of surgery is appropriate and decreases the rates of relapse occurrence, may decrease the volume of opioids needed for postoperative pain control, and does not prevent adequate analgesia during the operative and postoperative period (Attaar et al., 2021; Buresh et al., 2020; Goel et al., 2019; Kohan et al., 2021; Quaye & Zhang, 2019). Following an algorithm or protocol for managing the care of buprenorphine patients based on the surgery type, expected amount of postoperative pain, and whether the surgery is emergent or scheduled is another research-supported method for managing the care of buprenorphine patients (Jonan et al., 2018; Quaye & Zhang, 2019). Evidence also supports the use of a multi-disciplinary team-based approach and completing preoperative planning to improve the perioperative process for patients taking buprenorphine (Kohan et al., 2021; Ward et al., 2018). Utilizing multi-modal options for postoperative pain control is also supported by several evidenced-based research reports (Buresh et al., 2020; Goel et al., 2019; Jonan et al., 2018; Sharp et al., 2021; Ward et al., 2018.) In summary, the literature recommends maintaining patients on their regular dose before surgery, following an agreed-upon protocol while patients are in the perioperative setting, providing care using a multi-disciplinary team-based approach, and using a multi-modal approach to control pain postoperatively.

Conceptual Framework

The Institute for Healthcare Improvement's (IHI) Model for Improvement was used to guide the implementation of this project. Various tools provided by the IHI including a fishbone diagram (Appendix A) were used to examine contributors to the problem at the implementation site. The Plan Do Study Act cycle was used to guide the implementation of the project with the planning portion including deciding on answering the question of how staff can be more prepared and educated on best practice in caring for buprenorphine patients. The other question to be answered was whether the addition of education and increased communication between departments would improve the length of stay in the PACU for buprenorphine patients. The "Do" portion included providing education to the PACU staff and instating new protocols for communication between departments. The "Study" portion involved the collection of data including feedback from staff on difficulties encountered and the "Act" portion determined modifications needed for the next cycle for example, further education that would be helpful, and increased reminders to staff to communicate with other departments.

Aims

This quality improvement project aimed to improve the process of providing care to a buprenorphine patient who undergoes a surgical procedure. The project involved increasing staff education and communication between perioperative departments to strengthen communication between departments and increase PACU staff proficiency. The education provided to the PACU staff was presented to increase staff preparedness and indirectly improve buprenorphine patients' recovery process as evidenced by a shorter length of stay.

Methods

Context

This project was implemented in the perioperative units (preoperative, operating room, post-anesthesia care unit) of a 286-bed hospital located in a middle-sized city that provides care to patients at a local, state, and regional level. The perioperative departments cared for an average of 41.6 patients daily in 2023. The education was provided to 20 PACU staff members.

Interventions

There were three interventions implemented to improve the care of buprenorphine patients in the perioperative setting at the facility. The first intervention involved instructing the preoperative nurses to document the patients' buprenorphine status in the EHR. Each patient who undergoes surgery has a section of their chart for notes relevant to the individual patient and surgical case that is visible to any employee who views the surgery schedule including nursing staff, OR and anesthesia techs, and anesthesia providers. The preoperative nurses call every patient who has surgery at the facility provide them with preoperative instructions and review their home medication list which makes them the first initial contact from the facility. By including this note, documentation of the patient's buprenorphine status is easily visible to staff and providers.

The next intervention was for the charge nurse in the preoperative area to communicate with the PACU charge nurse and provide notification each time a buprenorphine patient was on the schedule. Advanced notification of a buprenorphine patient would allow the PACU staff to prepare for the patient and provide one one-on-one nursing care. These interventions were

implemented through the help of the preoperative nursing manager who instructed her staff to place a note in the patient chart and communicate to the PACU charge nurse.

The third intervention was the provision of education to the PACU staff on the mechanism of action of buprenorphine, the best options for treating pain for buprenorphine patients, and knowledge of available resources for additional support. These interventions were all implemented by the DNP student with assistance and support from the PACU manager, PACU educator, clinical pharmacist, and preoperative manager.

Measures

Data collection was conducted through a combination of chart review, interview of the PACU charge nurses, and compilation and analysis of survey and quiz responses. The charge nurses were asked whether they received notification from the preoperative charge nurse on days when buprenorphine patients were cared for in the PACU. The survey and quiz questions are provided in full in Appendix D. The first intervention was measured by a chart review completed by the DNP student. For each patient who met the project criteria, underwent a surgical procedure, and had buprenorphine prescribed, their chart was reviewed to ascertain whether they had a note indicating their buprenorphine status. This was determined by viewing the schedule for the operating rooms on the day of surgery. If there was a note indicating that the patient has buprenorphine on their home medication list, the patient was marked as a positive. If there was no note on the patient's surgical record it was marked as a negative.

The second intervention was measured by asking the assigned charge nurse for the day of surgery whether communication took place between the preoperative charge nurse and the PACU charge nurse. If the charge nurse indicated communication took place it was documented as a

positive, and if no communication occurred it was marked as a negative. The third intervention was measured by reviewing a read-and-sign document that was provided to the PACU staff on which they indicated that they had received and understood the provided education. The third intervention was further measured by a survey and quiz that was emailed to each PACU staff member through the facility email. The length of stay of patients in the PACU was another measure that was used to determine if the intervention of providing education and resources to the PACU nurses resulted in a decrease in the number of minutes patients spent in the PACU. When patients enter and exit the PACU, the time is documented in the EHR by the PACU nurse. The number of minutes each patient spent in the PACU was calculated and averaged after the charts of buprenorphine patients were reviewed by the DNP student.

Analysis

Data from each patient that met inclusion criteria was collected and organized by the DNP student including date of surgery, type of surgery, documentation of buprenorphine status, notification between the preoperative charge nurse and the PACU charge nurse, and length of stay in minutes in the PACU. Descriptive statistics including patients' gender and age were also documented. Length of stay was then calculated and averaged. Data from the survey and the quiz remained anonymous and was organized by the survey company, SurveyMonkey. The specific questions from the survey and quiz are included in Appendix D.

Results

During the implementation period for the quality improvement project, five patients had buprenorphine on their home medication list and had a surgical procedure. Four out of the five

patients had a note in their chart in the correct place documenting that they were taking buprenorphine. This calculates to 80% which is greater than the smart goal of 75%. The smart goal also aimed for notification from the preoperative charge nurse to the PACU charge nurse for 75% of buprenorphine patients. This goal was not met as only 1 out of the 5 patients or 20% was the PACU charge nurse notified.

The second smart goal was for 75% of the PACU nursing staff to receive education on caring for buprenorphine patients. This goal was met as the initial educational presentation was attended by 15 of the 20 staff nurses which is 75%. The read-and-sign document was signed by 15 of the 20 staff nurses who work in the PACU, 4 of whom were not in attendance at the staff meeting, meaning 19/20 staff members received the presented education either through the presentation or the read-and-sign, which is 95%.

The next smart goal was for 75% of the PACU staff to report increased proficiency in providing care for buprenorphine patients, and staff members to receive an average score of 80% or higher on the quiz to test their proficiency. The survey was sent to the 20 PACU staff members and completed by 13 members. Of the 13 members who completed the survey, 100% of respondents reported an increase in proficiency in caring for patients who are on buprenorphine in the PACU, with eight respondents marking their level of proficiency as “somewhat proficient” and five respondents marking their level of proficiency as “very proficient.” In response to the question “How would you rate your proficiency in understanding the mechanism of action of buprenorphine” one person responded, “not proficient,” eight people responded “somewhat proficient” and four people responded “very proficient.” The average score on the quiz portion of the survey was 77%, or 3.8 out of five points with four respondents receiving 100%, three

respondents 80%, four respondents 60%, and one respondent 40%. This is slightly lower than the goal of 80% or higher.

The fourth smart goal was a length of stay for buprenorphine patients of less than one hour. This goal was met as the median length of stay for the five patients was 54 minutes. This was also an improvement from the previous median length of stay from 2023 for buprenorphine patients of 96.3 minutes.

Figure 2 PACU Length of Stay 2024

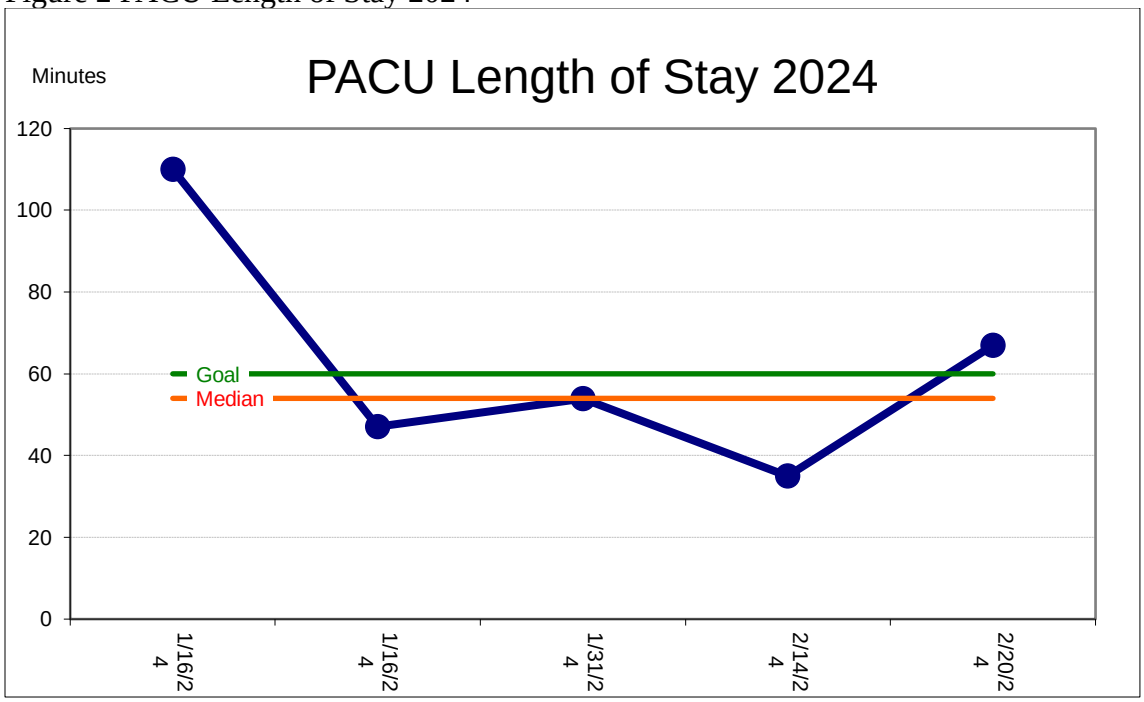
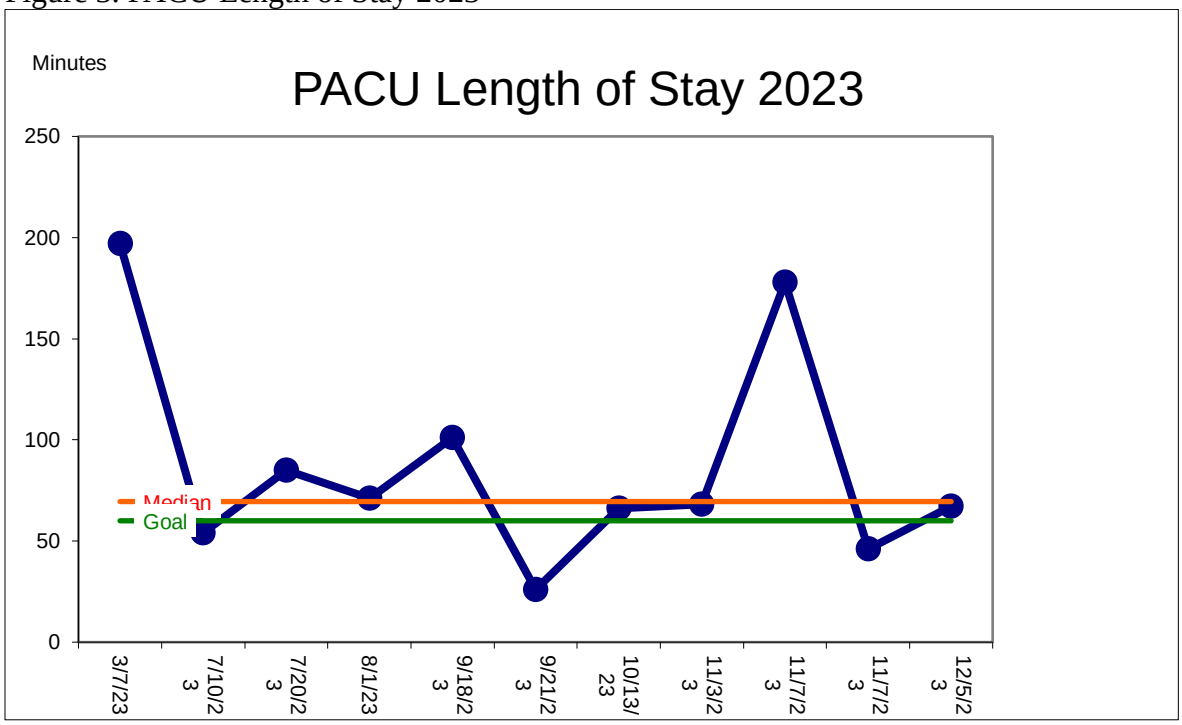


Figure 3. PACU Length of Stay 2023



Discussion

The results from this quality improvement project indicate that providing education on the mechanism of action of buprenorphine, the best options for pain control in the post-operative stage, and available resources, leads to increased proficiency among PACU staff nurses. As prescribing numbers of buprenorphine increase in response to the opioid epidemic and with the expanded prescription authority for all providers with a DEA number, PACU nurses will be providing postoperative care and pain control to an increasing number of buprenorphine patients (Kohan et. al, 2021.) The data suggests that as nurses become more comfortable with caring for patients and are aware of their best options for treating pain including providing buprenorphine postoperatively, the length of stay in the PACU will decrease. As improvement in length of stay is important to the entire perioperative process and workflow, decreasing the length of stay is

financially beneficial to the organization as a whole and contributes to overall perioperative efficiency.

The data from the project does indicate a reduced length of stay for buprenorphine patients after the intervention of the quality improvement project. As the length of stay for a patient in the PACU is influenced by several different factors including individual patient characteristics including pain tolerance, type of surgical procedure, availability of staff, and inpatient hospital beds, the improved length of stay may not be directly correlated to the interventions placed during the project. However, further research that included a larger sample of patients over a longer period with controls for the type of surgery, may offer more information into the correlation between pain management and length of stay in the PACU.

Improved communication between departments in the perioperative area could further improve the comfort and preparedness of the PACU nurse. Unfortunately, the intervention of notification between the preoperative charge nurse and the PACU charge nurse was only completed for one patient. The reasons behind the lack of communication may be related to the fast-paced nature of the preoperative area as the nurses care for a high volume of patients in a short amount of time, lack of communication from the preoperative manager to the staff of the expectation of additional communication to the PACU, or lack of motivation or support for the quality improvement project. There is no measurable connection between whether a note was placed in the patient chart and the length of stay for the patient in the PACU, however, notification of a patient's buprenorphine status would allow the PACU charge nurse to assign the patient to a nurse that could provide one to one care, as buprenorphine patients may require more attention from the nurse in the immediate postoperative period.

Although the completion rate of the survey was lower than the initial goal, the overall number of PACU staff members who received the education is an improvement from the project. The smaller percentage rate of completion of the survey and quiz may be attributed to several staff members who have “per diem” status and only work a few days per month. These staff members may not check their work email as frequently as they are not always on-site regularly, making it more difficult for them to complete the survey. The score on the quiz suggests that continuing education and repetition of the information would be beneficial to increase the overall knowledge level of the staff nurses. However, the 100% response of increased proficiency suggests that the provided education increased nurse comfort in caring for patients taking buprenorphine and alerted staff to the need for specialized care for patients in this population.

Limitations

The project was limited by the short period of implementation due to the small number of patients who met the criteria for inclusion in the quality improvement project. As the focused patient population is specific, further data could be collected over a longer period to allow for more patients to be cared for in the perioperative phase of the site and provide more data to support the aim of the quality improvement project.

The project was also limited by decreased committal from the preoperative staff. As they do not care for patients postoperatively, they are less directly affected by poor pain management for patients in the post-operative stage. The charge nurse in the preoperative area is also responsible for a large volume of patients, nurses, and tasks during the day, making it more difficult for them to communicate about specific patients with the PACU charge nurse.

Recommendations

Patients taking buprenorphine and undergoing a surgical procedure are a vulnerable population for which many nurses need additional education to increase their proficiency in providing safe, patient-centered care. Providing education on the mechanism of action of buprenorphine, the expected response of patients to anesthesia, special considerations for pain control in the postoperative period, and types of medications that are best suited for pain control can all help increase the proficiency and comfort of nurses in the perioperative setting. Increasing the communication between departments and making sure staffing assignments are appropriate to allow for the additional attention buprenorphine patients may require, will allow for patient safety and care in the post-operative period. Other nursing departments besides the perioperative area can benefit from additional education on caring for buprenorphine patients, especially nurses working on the inpatient floors of the hospital. These nurses often care for buprenorphine patients overnight and provide pain management including administration of buprenorphine. Increasing their knowledge and proficiency in providing care for buprenorphine patients would be beneficial.

Following a designated protocol is another useful intervention to ensure the care of buprenorphine patients is streamlined. A protocol will increase the chance of a patient not being weaned off their buprenorphine medication before surgery and allow for improved post-operative pain control and decreased chance of relapse after discharge from the hospital.

Further research on the best options for optimal pain control for buprenorphine patients undergoing a surgical procedure including more research on the benefits of not discontinuing buprenorphine before surgery is needed. Although several research articles support the continuation of buprenorphine through the perioperative period, many physicians remain wary of

caring for patients while on buprenorphine and may continue to suggest patients are weaned off their buprenorphine dose before their surgical procedure. Larger scale studies that investigate pain control for various surgeries, especially those with a high expected pain level postoperatively would be useful in further designing protocols for buprenorphine patients. Further research or quality improvement projects that investigate and design improved preoperative planning and education for buprenorphine patients would be beneficial in reducing patient anxiety around pain control and the surgical process. Investigating methods to increase communication between the prescribing physician and the surgeon is another area of improvement and would also allow for a smoother transition from the postoperative period to discharge from the hospital and reduce the incidence of postoperative relapse.

Conclusion

Opioid use disorder is a devastating epidemic that can be improved by increased use of buprenorphine and other medications to assist patients in recovery from opioid abuse (Wyse et al., 2021). Preparing for the care of buprenorphine patients in the perioperative setting will increase patient comfort, safety, and postoperative outcomes. Adequately preparing nursing staff for managing medications such as buprenorphine, and understanding how buprenorphine affects the surgical patient, will allow for a smoother recovery process, and decrease stress among nursing staff. Providing for patient pain control in the postoperative period will lead to decreased length of stay in the PACU which has positive effects on operating room flow, and overall patient flow through the perioperative stages.

CHAPTER FOUR

ADVANCED NURSING ESSENTIALS REFLECTION

The DNP program through Montana State University provided me with a comprehensive and interdisciplinary educational foundation to prepare me for practice as a Family Nurse Practitioner. This is demonstrated by my ability to fulfill core competencies for nursing education as approved by the American Association of Colleges of Nursing (AACN, 2021).

I first expanded my knowledge of systems and how integral they are to the healthcare system through the Design of Healthcare Systems course which helped me to evaluate how systems designs are used in various healthcare settings. This course introduced me to system tools such as value stream mapping, fishbone diagrams, and root cause analysis. In this class, I created my own current state value stream map to examine the flow of materials and information during the workflow process of a patient undergoing a surgical procedure at my current workplace. This allowed me to identify areas of time waste and inefficiency that could be mitigated by a change in process. I further applied my knowledge of systems work when developing my quality improvement project by creating a fishbone diagram to determine how different parties contributed to issues in the perioperative care of patients taking buprenorphine. I also developed a workflow diagram to evaluate the current process and to identify potential areas of improvement. This information informed the implementation plan for my project, allowing me to design appropriate interventions and create and provide specific education to the nursing staff.

Systems are an integral part of working in healthcare and learning how to analyze them and use system-based tools to identify areas that can be improved is a skill I will utilize in my

work as a nurse practitioner. Optimizing systems helps improve patient care, and workplace efficiency and reduce time waste. Understanding systems and the role they play in quality improvement as well as learning how to approach potential barriers to quality improvement will be essential in my future role as an APRN and in future quality improvement projects.

Domain 4 focuses on the DNP student's ability to conduct research, analyze the strength of the information available on a certain topic, and apply this knowledge to nursing practice (AACN, 2021). It is important that the DNP student understands ethical considerations when researching human subjects and can apply information gained from research to applicable policies and practice. The DNP program provided me with several opportunities to strengthen my skills in conducting scholarly research and applying this knowledge to nursing practice. Through two PICOT projects in which fellow students and I were tasked with finding strong evidence to help us answer a research question, I developed skills in searching databases, selecting research or articles that applied to the topic, critiquing the strength of these articles using tools such as the hierarchy of evidence or U.S. Preventative Services Task Force grading scale, and then organizing the data obtained from these articles using evidence tables. An evidence table was used to assist me in writing a literature review for each research question where I discussed and compared the current relevant research I had analyzed and identified its applicability to the research topic.

Conducting the research for my quality improvement project involved an extensive database review including reading and categorizing over 60 articles and selecting applicable and strong articles to support my project. Previous courses had prepared me to select appropriate evidence and organize and apply this information to my quality improvement project. In my

future practice as an APRN the research skills I developed during my DNP coursework will allow me to efficiently conduct research for various practice problems and inform and strengthen my clinical practice.

Domain 5 discusses the DNP student's role in providing care that is safe and informed by established practice guidelines based on scientific evidence (AACN, 2021). One of the essentials included in this domain centers around using quality improvement principles to inform care. In the Program Planning and Evaluation course I worked in a group to create a hypothetical quality improvement project on advanced care planning. This class and project introduced the fundamentals of conducting a quality improvement project, including learning about differing methodologies used to guide the process, especially the Plan Do Study Act (PDSA) cycle. This course helped prepare me to conduct my quality improvement project. Through my research for my quality improvement project, I identified evidenced-based protocols that other hospitals were using to provide compassionate and safe care to surgical patients who are prescribed buprenorphine. These research articles helped me to identify gaps in quality in the current process at the facility where my quality improvement project was implemented.

A DNP student should be prepared to provide person-centered care that is holistic, individualized, and based on evidence and clinical judgment. Person-centered care should emphasize diversity and inclusion and focus on the treatment of the person as a whole (AACN, 2021). The theme of person-centered care was addressed in all my DNP coursework but was especially evident in Vulnerability and Healthcare in Diverse Communities. During this class, I worked with other students to focus on the healthcare experience and disparities of a specific vulnerable population, the LGBTQIA+ community. Learning about the difficulties that patients

in this community often face allowed me to become aware of resources that are available and will help me to provide inclusive and compassionate care in my practice. As part of the fieldwork portion of this class, I completed training on creating a more inclusive healthcare clinic environment for patients that involved role-playing difficult conversations, and changes that can be made to forms and waiting areas to make them more welcoming and sensitive. When I become a provider, it is very important to me to provide inclusive care to patients and to have an awareness of patients in vulnerable populations and help them to receive well-rounded medical care, despite disparities they may face.

My ability to provide and support person-centered care is also evident in the work conducted in my quality improvement project. The population of patients who take buprenorphine is a vulnerable group that often faces discrimination and judgment when receiving medical care (Ward et al., 2018). My quality improvement project was influenced by a desire to improve the patient experience when undergoing a surgical procedure by identifying communication and process inconsistencies and improving staff education and proficiency in caring for this population.

In addition, I met this essential through my clinical coursework and completion of clinical hours where I practiced obtaining a patient history, assessing both acute and chronic conditions, developing a plan of care including ordering labs, medications, referrals, and diagnostic testing, and planning for follow-up care.

Domain 6 requires the DNP student to successfully engage in collaboration across the healthcare team to provide quality care and improve healthcare outcomes (AACN, 2021). In my clinical experiences, I have witnessed the importance of collaboration between various members

of the healthcare team and witnessed how patient care is improved when multiple disciplines collaborate. Especially in complex patient cases, teamwork between the provider, pharmacist, nursing staff, and care management allows for improved patient care, utilization of facility and community resources, and an overall improved patient experience. Through my clinical experiences, I have had the opportunity to discuss a team-based approach with providers and witness how the team works within their practice to assist patients in reaching their healthcare goals.

Planning and implementing my quality improvement project required identifying and communicating with stakeholders across various disciplines. Support and education from the pharmacy department at the clinical site were imperative in furthering my understanding of buprenorphine including dosages and types of buprenorphine formulations that are administered at the clinical site. The pharmacy also assisted me in looking at how buprenorphine has been administered in the past at the clinical site which helped me to plan an intervention that was appropriate for the facility. Information and support from health informatics and the business manager of the perioperative departments were also critical in the planning portion of the project and allowed me to analyze data from previous patients and review patient charts during the implementation of the project. I relied on support and communication between different nursing departments and nursing management in the proposal and planning stages and the implementation, and their support allowed me to provide education and feedback to staff throughout the process.

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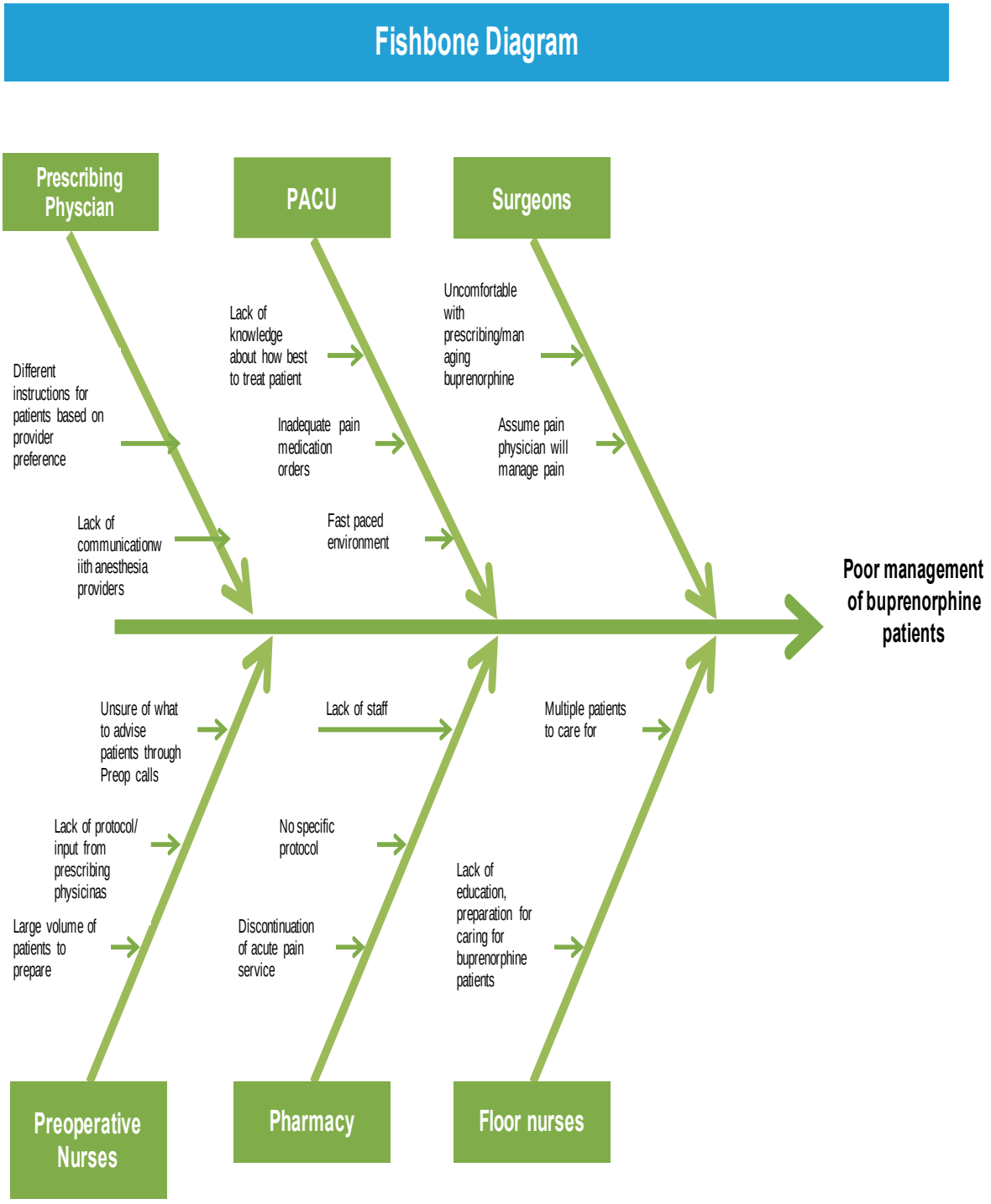
APPENDICES

APPENDIX A

FISHBONE DIAGRAM

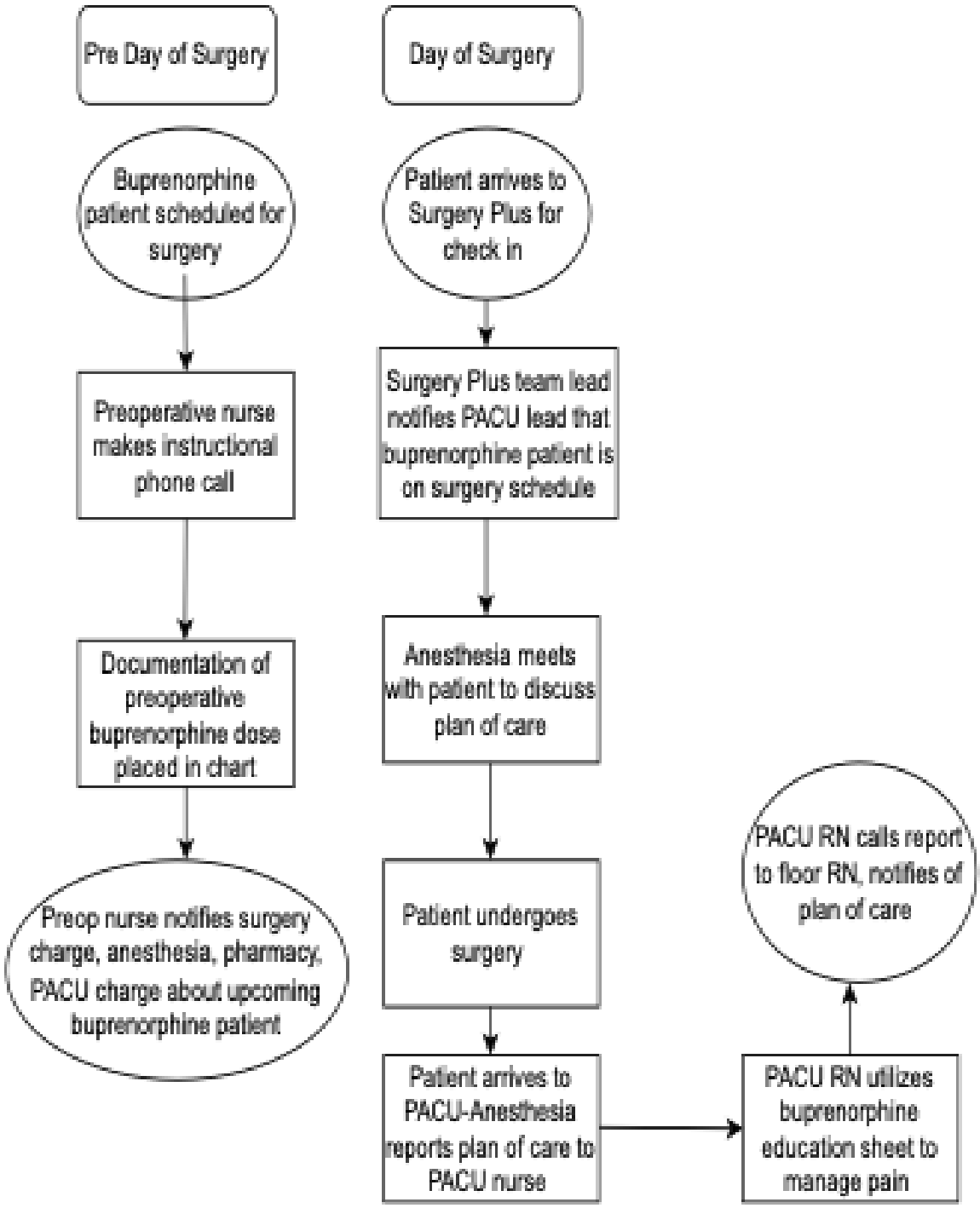
Figure 4. Fishbone Diagram



APPENDIX B

PERIOPERATIVE PROCESS FLOW DIAGRAM

Figure 5. Perioperative Process Flow Diagram



APPENDIX C

PACU STAFF EDUCATION GUIDE

GUIDE FOR CARING FOR BUPRENORPHINE PATIENTS IN THE PACU

Buprenorphine (Suboxone, Zubsolv, Sublocade, Buprenex)

- Prescribed for patients to treat opioid use disorder or for chronic pain
- Opioid partial agonist-Binds to mu-opioid receptors in the central nervous system, occupies receptors but produces lesser effect than full opioid agonist (i.e. Fentanyl, Dilaudid).
- Analgesic effect plateaus at higher doses
- Weak kappa antagonist-Reduces stress response, reduces addiction cravings
- Average half-life of 38 hours following sublingual administration

Buprenorphine is available through the pharmacy in the following formulations:

- Buprenex .03mg/mL IM injection q 6 hours
- Bunavail buccal film q 12 hours
- Zubsolv sublingual tablets
- Suboxone sublingual film

Options for Pain Control while in PACU

- Continue home dose of buprenorphine
  - Obtain order from anesthesia provider
  - Place order and contact OR pharmacist
  - OR pharmacist will bring buprenorphine dose into PACU
- Dilaudid
  - Has comparable binding affinity to buprenorphine
  - Best opioid option for pain control
  - Can contact anesthesia for increased maximum dose to 3 mg while in PACU
  - Consider PCA
- Non-opioid options
  - IV Tylenol
  - IV Toradol depending on type of surgery
  - Gabapentin
  - Alpha 2 agonists-Clonidine, tizanidine

Other tips

- Avoid long-acting opioids!
- Contact OR pharmacist for questions or additional support
  Include plan of care in handoff to floor staff

APPENDIX D

SURVEY AND QUIZ QUESTIONS

1. Before receiving the education how would you rate your knowledge about buprenorphine?

- ◯ Not proficient
- ◯ Somewhat proficient
- ◯ Very proficient

2. After receiving the education how would you rate your current proficiency at caring for buprenorphine patients?

- ◯ Not proficient
- ◯ Somewhat proficient
- ◯ Very proficient

3. How would you rate your proficiency in understanding the mechanism of action of buprenorphine?

- ◯ Not proficient
- ◯ Somewhat proficient
- ◯ Very proficient

4. How many buprenorphine patients have you taken care of during your time in PACU?

- ◯ 0
- ◯ 1-4
- ◯ 5+
- ◯ Not sure
- ◯ Other (please specify)

5. Is there additional information about buprenorphine that you feel would be helpful?

* 6. Which opioid medication other than buprenorphine is your best option for treating severe pain in a post operative patient?

- ◯ Fentanyl
- ◯ Oxycodone
- ◯ Hydromorphone
- ◯ None of these

7. Which of the following best explains the mechanism of action of buprenorphine?

- ◯ Does not bind to opioid receptors but prevents other medications from working as effectively
- ◯ Binds to opioid receptors but produces less activation than other opioids
- ◯ Works in conjunction with other opioids, allowing for better pain control
- ◯ Prevents other opioids from fully binding to receptors
- ◯ Both B and D
- ◯ None of the above

8. If you care for a patient who takes buprenorphine you may ask anesthesia for an order for buprenorphine to be given in the PACU

9. Which of the following is true about buprenorphine?

- ◯ It is the same type of medication as methadone
- ◯ It has a ceiling effect meaning it causes less respiratory depression
- ◯ It is a full opioid receptor antagonist
- ◯ It can only be prescribed by providers who have taken special training

10. Which of the following can help with pain control in patients taking buprenorphine?

- ◯ IV Tylenol
- ◯ IV Toradol
- ◯ Gabapentin
- ◯ Ketamine
- ◯ Clonidine
- ◯ All of the above
- ◯ None of the above