Protocol Title: The Impact of Pre-operative Opioid Education and Opioid Disposal Following Shoulder Arthroplasty

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I. Abstract

Opioid medications are widely used after many orthopedic procedures and are routinely prescribed after shoulder replacement surgery. Despite the high prevalence of opioid abuse and misuse, there is no standardized mechanism for patients to dispose of unused opioid medications safely and securely and the average number of opioid pills required after shoulder replacement surgery is still unknown. In a prior pilot study conducted by our group (IRB# 202012142), we analyzed opioid consumption patterns of patients undergoing shoulder arthroplasty as well as their adherence to a safe and secure disposal mechanism for excess opioid pills. We achieved a 94% retention rate and preliminary results showed that most of the subjects were 60 years of age and older.

The objective of the current proposal is to: (1) develop pre-operative education materials related to post-operative opioid use following shoulder arthroplasty; (2) pilot the impact of this educational intervention; (3) examine the effect of providing disposal mechanisms for unused opioid pain medications following shoulder arthroplasty. Our proposal is to conduct a single blinded randomized controlled trial of patients undergoing total shoulder replacement, both anatomic total shoulder arthroplasty (TSA) and reverse shoulder arthroplasty (RSA) at UIHC. This randomized controlled trial will compare: (1) education plus opioid disposal to the standard of care (SC). We hypothesize that pre-operative opioid education modules combined with a structured opioid disposal program will decrease opioid consumption following shoulder arthroplasty.

II. Background and Significance/Preliminary Studies

Opioid medications are involved in thousands of deaths in the United States annually (1), and the opioid crisis remains a major public health concern in the United States. Since 1999 overdose deaths involving opioids, including prescription opioids, heroin, and synthetic opioids, have increased significantly (2). Despite the opioid epidemic being declared a public health emergency by the Department of Health and Human Services (HHS) in 2017, there are still unmet needs and therefore strategies that provide durable solutions to the opioid crisis are critical.

According to data published by the Department of Health and Human Services, increased prescription of opioid medications led to widespread misuse of both prescription and non-prescription opioids (15). The number of overdoses and deaths from prescription opioids has increased since 1990 and correlates with a growth in the number of opioid prescriptions (3).

Opioid medications are commonly prescribed for orthopedic conditions. In addition to the risk of abuse, opioids carry a number of other health risks such as respiratory depression, confusion (5), and an increase in the risk of falls and fractures among seniors (16). The concern for opioid abuse and misuse is rising among the elderly population. An article published in the CDC's Morbidity and Mortality weekly report showed that during 2017-2018 even though opioid-related death rates decreased for persons aged 15-64, these rates actually increased among persons aged ≥ 65 years old (17). Furthermore, the HHS Office of Inspector

General released a report based on an analysis of prescription drug event records for Medicare Part D which revealed that in 2016 one out of every three beneficiaries received at least one opioid prescription (7).

The rate of shoulder arthroplasty has increased dramatically over the past 10 years (6, 12). Most patients undergoing shoulder arthroplasty are over the age of 60. In our pilot study we found that 81% of our subject population were >60 years of age. We believe that it is crucial to address opioid consumption patterns among this elderly population.

Previous studies have tested interventions to promote disposal of excess opioids in an effort to address the opioid crisis (4, 8, 11). In addition, other authors have focused on opioid consumption after shoulder surgery (10, 13, 14). Still, there is no standardized mechanism for opioid disposal or postoperative opioid prescribing protocol for shoulder replacement surgery. We propose a new and multi-faceted approach that combines proper patient education and a secure disposal technique which proved to be successfully accepted in our pilot study. This approach will help in developing a more accurate and standardized postoperative pain management plan for patients undergoing shoulder arthroplasty. These same techniques can eventually be validated for other orthopedic surgical procedures.

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III. Study Aims

AIM 1: Develop pre-operative opioid educational modules for patients undergoing shoulder arthroplasty.

AIM 2: Evaluate the impact of educational materials on opioid consumption following shoulder arthroplasty when compared to standard of care. Hypothesis: Pre-operative educational modules, developed by an interdisciplinary team, will prove to be successful in decreasing the amount opioid medication taken after shoulder arthroplasty.

AIM 3: Evaluate a structured and streamlined disposal protocol and its effect on opioid disposal rates. Hypothesis: By promoting and implementing a structured and secured opioid disposal mechanism, patients undergoing shoulder arthroplasty will more frequently dispose of excess opioid medications.

IV. Administrative Organization

Participating units will include the University of Iowa Hospitals and Clinics located at 200 Hawkins Dr., Iowa City, IA 52242 and UIHC IRL shoulder surgery clinic located at 920 East 2nd Avenue, Coralville, IA 52241.

V. Study Design

Experimental design: single-blinded randomized controlled trial of patients undergoing total shoulder arthroplasty.
The study will include male and female patients ≥ 18-years-old who have been indicated for total shoulder arthroplasty. The total number of subjects will be 136. Sample size determination and power analyses: A sample size estimate was performed based on previous literature and data from our pilot study that showed nearly 55% of subjects returned 10 or more out of 40 tablets. Assuming ~55% will return 10 or more out of 40 tablets in the control group, a total of 68 subjects per group (n=136 total, with calculated 10% drop out) would provide 80% power, with an alpha level of 0.05 (2-sided test), to detect a 25% difference in the proportion who return 10 or more tabs in the brochure/video intervention group (35%).

a. Study outcomes/endpoints:

AIM 1: Develop pre-operative opioid educational modules for patients undergoing shoulder arthroplasty.

AIM 2: Evaluate the impact of educational materials on opioid consumption following shoulder arthroplasty when compared to standard of care.

AIM 3: Evaluate a structured and streamlined disposal protocol and its effect on opioid disposal rates.

VI. Study Procedures

Inclusion criteria: patients who are 18 years of age and older who are indicated for primary total shoulder arthroplasty (both anatomic and reverse) at the Shoulder Surgery clinic at UIHC. All patients will be English speaking and have the ability to provide informed consent for the study. Patients will be excluded if they are <18 years old, non-English speaking, pregnant, unable to consent for themselves, revision shoulder arthroplasty, arthroplasty for proximal humerus fracture, patients with a history of chronic opioid

consumption or patients who have contraindications for opioid consumption.

The medical records will only be accessed by the investigators for the purpose of collecting data pertaining solely to the study at hand and only data necessary to answer the research questions will be collected from the subjects' medical records. The study will involve the same data we would have access to in the course of our professional relationship with the patient. This data will only be available to the primary investigator and to the research coordinator. Without access to protected health information we would be unable to assess inclusion/exclusion criteria and the variables in study. Only members of the research team will have access to the protected health information. All identifying paper documents will be kept in locked cabinets at the research coordinator's office. All electronic information will be kept in password protected files. Data will be collected using REDCap. Identifying information will be destroyed after all analysis has been completed and it is no longer needed.

Potential subjects will be approached in person during their usual visit to the Shoulder Surgery clinic. They will be provided a brochure with information about the research study. Discussion regarding the study and consent will be obtained in person in clinic.

During their preoperative work-up visit, at IRL and Main Hospital, patients will be invited to participate in the research study. The research coordinator will discuss the study with potential subjects in a private office or exam room. If the patient shows interest in participating, the research coordinator and the patient will go through the process of consent of participants. Potential subjects will be explained that the purpose of the study is to assess opioid consumption and disposal after shoulder replacement surgery, and that after their surgery, they will have to answer daily questionnaires about pain management and opioid consumption, that will be delivered through text message only during the first 2 weeks after surgery. Adequate time will be allotted to the patients in clinic to consider participating in the study. The study will require a waiver of an element of consent, in relation to the use of deception and blinding of subjects. Without the waiver of the element of consent our study results may be biased as subjects in the standard of care group may potentially change their behavior if they were aware of the information being concealed.

Patients will be screened according to inclusion and exclusion criteria at their indication visit for total shoulder arthroplasty. Participants will receive daily text messages with a link to a REDCap survey during the 2 weeks following the surgery. For participants who did not answer the daily surveys, or for the ones who are still taking opioid medications after 2 weeks, a survey will be available at clinic. Subjects will be able to answer the survey at their scheduled postoperative visits (standard of care). Participants will not have to attend any visits for research purposes only.

Patients will be randomized utilizing redcap. The randomization scheme will be performed in a 1:1 ratio.

After signing the informed consent, participants will be randomized into one of the 2 study arms (Arm 1: control/SOC, Arm 2: education and disposal).

Participants in Arm 1 will be the control group. These patients will undergo evaluation and treatment for total shoulder arthroplasty according to the current standard of care at the institution. This does not currently include any preoperative educational material regarding opioid consumption and/or disposal.

Participants in Arm 2 will receive at their preoperative work-up visit a brochure and will watch an educational video. Both educational materials (brochure and video) will address information about opioid medication, pain management techniques and how to properly dispose of any excess opioid medication after the surgery. In addition, participants in Arm 2 will receive an envelope in which they will be able to dispose their unused opioid pills. These envelopes will be the same ones used in our pilot study (IRB# 202012142). The disposal method consists of secured, labeled envelopes to dispose of the excess of Opioid medication. These envelopes will be provided by "Sharps Compliance, Inc.", a company that manages pharmaceutical waste disposal programs for healthcare facilities. Through their "TakeAway Medication Recovery System Envelope (USPS)" they allow the collection and disposal of controlled substances (Schedules II-IV) and non-controlled medications. Subjects will be explained how to use the envelope and that since it is labeled they will not have to cover any charges.

Potential subjects will be explained that the purpose of the study is to assess opioid consumption and disposal after shoulder replacement surgery, and that after their surgery, they will have to answer daily questionnaires about pain management and opioid consumption, that will be delivered through text message only during the first 2 weeks after surgery. The questionnaires will be built using REDCap platform. Text messages will be sent using a platform built by the Mobile Technology Lab at UIHC.

Participants who did not answer the daily survey, or who continue taking opioid medications after 2 weeks following surgery, will have the opportunity to answer the survey at their postoperative visit at the Shoulder Clinic, using the clinic's tablets, either at their 2-week or 6-week postoperative visit.

Subjects lost to follow up will not be recontacted.
Subjects will not receive monetary compensation.

VII. Privacy and Confidentiality Protections

Only members of the research team will have access to the protected health information. All identifying paper documents will be kept in locked cabinets at the research coordinator's office. All electronic information will be kept in password protected files. Data will be collected using REDCap. Identifying information will be destroyed after all analysis has been completed and it is no longer needed.

VIII. Risks and Benefits

The only foreseeable risks of this study are loss of confidentiality, boredom or fatigue from filling daily surveys.
There are no direct benefits to subjects.
After completion of the proposed RCT, we expect to see a decrease in opioid consumption patterns after shoulder arthroplasty, as well as an increase in disposal of unused opioid pills. One of our expected outcomes is that our educational interventions will have a positive influence on opioid consumption after surgery. In addition, we expect that this group will be encouraged to use drug-free pain management techniques and find the educational materials satisfactory. Our second expected outcome is that the proposed disposal method will have high satisfaction rate for patients to dispose of unused opioid pills. The implementation of a secure and efficient disposal mechanism will encourage patients to remove potentially dangerous medications from their homes and this disposal program could become a standard of care practice for shoulder arthroplasty procedures. To date, there is no standardized educational intervention that is routinely administered preoperatively to all patients to approach postoperative opioid consumption, disposal, and pain management techniques. This proposal aims to gather the necessary information to build a larger study and eventually include other surgical procedures.

IX. Data Analysis Plan

The primary outcome measure is opioid consumption with and without pre-operative opioid education. By comparing the two arms we will determine the difference in opioid consumption between groups of patients who receive education and those who do not. We will also analyze opioid disposal in the two groups and compare disposal rates.

Descriptive statistics (means, medians, percentages, standard deviations, and inter-quartile ranges) for all variables will be computed overall and for each intervention group . The distributions of continuous variables will be evaluated for normality. If distributions are non-normal, continuous variables will be described as median (interquartile range) and compared across intervention groups using Wilcoxon-rank sum tests. Otherwise, continuous variables will be described as mean±standard deviation and compared between intervention groups using independent t-tests. Categorical variables will be reported as frequencies(percentages) and compared between groups using the chi-square or exact test, as appropriate. To account for multiple comparisons between the three groups, p-values will be adjusted using the stepdown Bonferroni approach. We will utilize the chi-square test to determine whether there is a significantly greater proportion who (Hypothesis 1) return more than 10 tablets in Arm 2 versus Arm 1; and (Hypothesis 2) properly dispose of unused tablets in Arm 2 versus control Arm 1. If necessary, we will adjust for potential covariates using logistic regression in place of the chi-square test with the control group serving as the referent group.

A sample size estimate was performed based on previous literature and data from our pilot study that showed nearly 55% of subjects returned 10 or more out of 40 tablets.

Assuming ~55% will return 10 or more out of 40 tablets in the control group, a total of 68 subjects per group (n=136 total, with calculated 10% drop out) would provide 80% power, with an alpha level of 0.05 (2-sided test), to detect a 25% difference in the proportion who return 10 or more tabs in the brochure/video intervention group (35%).

X. Literature Citations

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