NON-STEROIDAL ANTI-INFLAMMATORY DRUG ADMINISTRATION AND ACUTE KIDNEY INJURY AFTER ROBOTIC ENHANCED RECOVERY PROTOCOL SURGERY

by

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A scholarly project submitted to the faculty of
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ABSTRACT

ANA GABRIELA ARIAS. Non-steroidal Anti-inflammatory Drug Administration and Acute Kidney Injury after Robotic Enhanced Recovery Protocol Surgery.
(Under the direction of DR. DAVID LANGFORD)

Application of enhanced recovery protocols with robotic surgeries has gained favor across the country because of improved patient recovery times. Acute kidney injury is the number one postoperative complication for a large, urban trauma center. Use of non-steroidal anti-inflammatory drugs (NSAID) are favored in enhanced recovery protocols (ERP) due to their ability to decrease inflammatory responses associated with surgery and the absence of opioid side effects like respiratory depression, nausea and vomiting, and lack of cognitive effects. NSAIDs reduce the inflammatory response by inhibiting prostaglandin synthesis through inhibition of cyclooxygenase-1 (Cox-1) and cyclooxygenase-2 (Cox-2). Prostaglandins are vasodilators in the kidneys and generally do not contribute to regulating renal perfusion except in low perfusion states (Bell et al., 2020). Limiting the kidney's ability to regulate flow during low perfusion states increases the risk of acute kidney injury. This project is a retrospective, descriptive design looking at the incidence of acute kidney injury (AKI) within the 48-hour postoperative period following the administration of intraoperative non-steroidal anti-inflammatory drugs. The data collection period started in May 2022 and ended in August 2022. Patient and surgical characteristics of age, sex, surgical service, procedure duration, and NSAID dosage were all extracted from the electronic health record and evaluated. While the findings were not statistically significant across AKI and age, sex, procedure time, or dosage; findings are clinically significant suggesting there could be an increased incidence of AKI in patients greater than 55 years old receiving NSAIDs.

DEDICATION

This scholarly project paper is dedicated to my family. My son, Maximiliano Arias, thank you for inspiring me and motivating me each and every day. My parents and my brother Maria, Pastor, and Bryan Arias. You have all motivated me and supported me unconditionally. To the rest of the village that are my family and friends, this would not have been possible without each of you.

ACKNOWLEDGEMENTS

I would like to acknowledge all those involved in this process, who made this possible. My team members, Lloren Hile and Mark Fortygin, who were essential in this project's completion and success. Additionally, I would like to thank the committee for their support throughout this process. All their guidance and feedback made this possible. Dr. Elena Meadows played a crucial role in the early and middle stages of development this project. Dr. Deepu Ushakumari was essential early on in helping us determine individual project topics. Access and navigation of the electronic health record dataset would not have been possible without Dr. Sherry Bernardo. Statistical analysis of data would have been challenging without the help of our committee member, Dr. Zhuo Job Chen. Dr. Karen Lucisano took over our group as faculty committee member and led us through the data collection and analysis stage. Dr. Patricia Crane provided support and constructive feedback improving my writing abilities and confidence in this project. Finally, Dr. David Langford whose guidance and support led us through this process.

Last, but certainly not least, completion of this project would not have been possible without the support of my family. My son, Maximiliano Arias, my brother, Bryan Arias, and my parents, Maria and Pastor Arias, have kept me motivated throughout this entire journey and provided endless emotional support.

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LIST OF ABBREVIATIONS

AH	Atrium health
AHEC	Area Health Education Center
AKI	acute kidney injury
ASA	American society of anesthesiologists
CMC	Carolinas medical center
COX-1	cyclooxygenase-1
COX-2	cyclooxygenase-3
ERP	enhanced recovery protocols
IRB	institutional review board
KDIGO	Kidney Disease: Improving Global Outcomes
NSAID	non-steroidal anti-inflammatory drug
PDSA	plan-do-study-act
UOP	urine output

CHAPTER 1: INTRODUCTION

Problem Statement

Patients undergoing robotic surgery with enhanced recovery protocols (ERP) may have an increased risk of developing an acute kidney injury (AKI). Robotic surgeries and enhanced recovery protocols (ERP) each have separate attributes that, when combined, place patients at risk for developing AKI.

The Kidney Disease: Improving Global Outcomes (KDIGO, 2012) guidelines state AKI is an "increase in serum creatinine >0.3 mg/dL in 48 hrs or urine output (UOP) <0.5 ml/kg/hour for 6-12 hours" (p. 8). AKI development can lead to increased complications and hospital costs (Joo et al., 2016; Kong et al., 2018). While studies have examined AKI development in these populations separately, the risks associated with robotic ERP procedures have yet to be studied. AKI after robotic ERP surgery was identified as an outcome of robotic surgeries exceeding the recommended benchmark by the anesthesia department of a large health system in the southeastern United States and was the focus of this quality improvement project.

There is currently an average of five robotic cases per day at Atrium Health (AH) Carolinas Medical Center (CMC), leading to approximately 25 cases per week. Totaling about 1,300 cases per year. In addition, AKI is the number one complication in both colorectal and abdominal service lines and the fourth most common complication in the gynecologic service line at CMC (CMS MedPar, 2019).

There are factors related to the technique of robotic surgeries that may increase the risk of developing AKI. These factors include abdominal insufflation with carbon dioxide and extreme trendelenburg positioning in some procedures (Naito et al., 2020; Sato et al., 2020). Insufflation pressure can collapse the vasculature in the abdomen and reduce renal blood flow, while steep trendelenburg positioning drives blood volume toward the head and away from lower structures

of the body. In addition, robotic surgeries generally have longer surgical times than open procedures, increasing patients' exposure to anesthesia and surgical stress (Joo et al., 2016).

Enhanced recovery protocols (ERP) are being implemented in hospital systems across the country to improve patient recovery times and reduce opioid use. Enhanced recovery protocols are a series of guidelines for surgical procedures meant to decrease recovery times after surgeries and improve patient outcomes (Zorrilla-Vaca et al., 2020). One of the complications of ERP is the risk of increased acute kidney injury (AKI) development (Koerner et al., 2019). A primary tenet of enhanced recovery protocols is restricted fluid administration during procedures, which may lead to decreased renal perfusion. Another foundation of ERP is the decreased use of opioids and the increased use of non-steroidal anti-inflammatory drugs (NSAID), which may potentially affect kidney function (Zorrilla-Vaca et al., 2020). Inhibition of the vasodilatory effects of renal prostaglandins from NSAIDs, paired with perioperative conditions such as reduced blood flow to the kidneys, place patients at increased risk for reduced kidney function (Bell et al., 2018). Many factors of ERP procedures could impact the risk of AKI development, but there is uncertainty about which factor has a greater effect.

In addition to the surgical and ERP factors that may place patients at risk, individual patient risk factors can affect AKI development. For example, one study found that robotic surgery patients with diabetes, obesity, increased baseline glomerular filtration rate (GFR), and being male had a higher rate of AKI development (Martini et al., 2019). Another study examining ERP patients found that patients with hypoalbuminemia, age greater than 60 years, being male, physical status classification III-IV based on American Society of Anesthesiologists (ASA) and having pre-existing chronic kidney disease were more likely to develop AKI (Zorrilla-Vaca et al., 2020).

Background

Enhanced recovery protocols for elective non-cardiac surgeries have become more popular as studies have shown overall decreased length of stay, complications, and mortality (Lee et al., 1999). The primary pain management modality is opioid-sparing techniques through multimodal analgesia. The multimodal analgesia approach includes administration of gabapentinoids and an oral non-steroidal anti-inflammatory drug (NSAID) in the preoperative period and an intravenous NSAID in the intraoperative period (Gustafsson et al., 2019). Further, ERP at CMC includes a discussion of also adding intraoperative administration of intravenous Ketorolac, non-selective cox inhibitor, at the end of the procedure.

The primary mechanism of action of NSAIDs is through inhibition enzymes of cyclooxygenase-1 (COX-1) and cyclooxygenase-2 (COX-2), both responsible for prostaglandin synthesis. The enzymes COX-1 and COX-2 are found in many places within the kidney as well as throughout the body regulating normal physiologic function in tissues like the brain, bones, stomach, and platelets (Bell et al., 2018). Prostaglandins in the kidneys are responsible for vasodilation of the afferent arterioles (Lapi et al., 2013). Under normal physiologic conditions of maintained renal perfusion and normal fluid volume status, renal prostaglandins do not contribute significantly to kidney blood supply (Bell et al., 2018). In states of low volume status and reduced kidney perfusion, arteriole vasodilation from prostaglandin synthesis aids in maintenance of renal blood supply to avoid ischemia (Bell et al., 2018; Lapi et al., 2013). Inhibition of these prostaglandins coupled with states of low blood volume leads to afferent arteriole vasoconstriction, further risking kidney injury (Lapi et al., 2013).

While statistically significant associations between NSAID administration and AKI incidence have not been found, some risk factors have been identified. Yu et al. (2020) and

Hassinger et al. (2018) include combined NSAID use and diuretic use as risk factors. Hassinger et al. (2018) list additional risk factors specific to surgical conditions like operating time greater than 200 minutes, ureteral stent placement, and patient functional status. Zorrilla-Vaca et al. (2020) advise that in high-risk patients, providers should consider holding or adjusting NSAID dose based on age or creatinine clearance, consider less restrictive fluid management guidelines, and consider non-epidural regional pain management to avoid the systemic effects of low blood pressure.

Purpose

This project aims to determine the association of NSAID administration as a potential risk factor contributing to the development of AKI in robotic ERP procedures at Carolinas Medical Center. This project is part of a larger project examining several factors in robotic and ERP surgeries related to increased risk of AKI that have been identified as an area of concern by the Quality and Anesthesia Departments.

A retrospective chart review of months May through August 2022 examined intraoperative NSAID administration during robotic ERP surgeries to determine the relationship between NSAID administration and serum creatinine levels up to 48 hours postoperatively. Administration of NSAIDs is a variable anesthesia providers can control. The administration of the NSAID will be examined to determine its effect on creatinine levels, an indirect measure of AKI. If the data suggest a link between these factors and AKI development in the operating room environment of the medical center, then future projects can be designed to improve current practice and can work towards developing practice guidelines to reduce AKI occurrence at Atrium Health Carolinas Medical Center.

PICOT Question

Among adult patients undergoing robotic ERP surgeries who received an intraoperative dose of a NSAID, what is the incidence of AKI development in the 48-hour postoperative period? Acute kidney injury will be determined by comparing preoperative serum creatinine levels to those within the 48-hour postoperative period.

CHAPTER 2: LITERATURE REVIEW

Electronic databases were searched throughout Fall 2021 and Spring 2022 to identify relevant literature. Database access was obtained through the North Carolina Area Health Education Center (AHEC) digital library. PubMed Medline, PubMed Central, CINAHL complete, and Cochrane library were utilized. Boolean search operators utilized were "acute kidney injury AND enhanced recovery protocol", "acute kidney injury AND non-steroidal anti-inflammatory drugs." Four studies were found and used for the literature review.

Bell et al. (2018) performed a review of 26 intervention studies (N=8943) to determine the effect of perioperative NSAID use on postoperative kidney function in patients with normal preoperative kidney function. Surgery types in this review varied to include open cardiac, abdominal/pelvic, and other non-cardiac surgeries. Overall findings suggest that NSAIDs had undetermined effects on the risk of postoperative AKI, potentially increasing postoperative serum creatinine. This review included a large number of participants, but there were inconsistencies in findings and publication bias. A limitation is that some of the studies reviewed were published prior to the universally accepted definition of AKI by Kidney Disease: Improving Global Outcomes (KDIGO) in 2012. In addition, some studies included only patients with no comorbidities, limiting the surgical population to which the findings may be most applicable.

StarSurg Collaborative (2020) performed a prospective, multicenter, observational cohort study analyzing Outcomes After Kidney Injury in Surgery (OAKS). NSAID administration was defined as "early" if 0-3 days postoperative and "late'' if within 4-7 days postoperative. The findings revealed that early postoperative administration of NSAID did not increase AKI incidence in the 7-day postoperative period. A limitation of this study is that it was conducted in

the United Kingdom where oral preparations such as ibuprofen are more commonly administered than intravenous solutions of NSAIDs such as ketorolac. In the U.S., intravenous use of ketorolac is a routine part of the enhanced recovery protocols. This difference could affect findings as the side effect profile of intravenous administration of ketorolac would not be equivalent to that of oral ibuprofen.

Yu et al. (2020) conducted a case-control study in hospitalized patients > 18 years of age to assess the features of drug-induced AKI. Their criteria for AKI consideration was that of the universally accepted KDIGO. They excluded those with chronic kidney disease (CKD), missing lab values or incomplete records, dialysis patients, and those who underwent renal transplantation. Results showed that the use of NSAIDs increased the risk of drug-induced AKI by 2.39-fold. More specifically, the use of NSAIDs and diuretics in the context of anemia were identified as risk factors for AKI development. Limitations included renal biomarkers not measured and AKI diagnosis was made based on changes to serum creatinine alone. The population of this study is specific to hospitalized patients and not post-surgical patients alone.

Hassinger et al. (2018) evaluated patients undergoing elective colorectal surgery and compared AKI rates before and after implementing enhanced recovery protocol (ERP). Of 900 cases, 114 cases resulted in AKI. In this study, there was no standard protocol for NSAID administration prior to ERP, resulting in variability in dosage administration. While there was not a significant difference in the rate of AKI between both groups, multivariate analysis identified NSAID administration as a risk factor for AKI development. Like the StarSurg Collaborative (2020) the NSAID was an oral administration of celecoxib preoperatively and postoperatively instead of the intravenous administration of NSAIDs used at CMC. An additional limitation of this study is that bowel preparation necessary for colorectal surgeries

alone places patients at risk of electrolyte imbalances and dehydration. Thus, dehydration may have confounded the results.

Study findings are consistent in demonstrating there are surgical and patient-specific risk factors affecting the risk for AKI after robotic ERP surgery. Outcomes for NSAID administration and AKI demonstrate varying results. Surgical conditions specific to robotic surgeries affect the risk for AKI. Adding the effects of NSAID administration in combination with other surgical conditions could further increase the risk for AKI.

CHAPTER 3: METHODOLOGY

Conceptual Framework

The conceptual framework for the project is the Plan-Do-Study-Act (PDSA) model (PDSA, 2022). The "Plan" is to identify the relationship between NSAID administration and AKI development in the 48-hour postoperative period within a specific medical center. For the "Do" step, NSAID dose, preoperative and postoperative creatinine will be collected from the electronic health records of 50 patients having undergone robotic ERP procedures between May 1st, 2023 to August 31st, 2023. In the final step, if findings show that NSAID administration affects the incidence of AKI, the "Act" phase will result in developing recommendations for future quality improvement projects to change care practices and develop and implement protocols that can decrease AKI incidence.

Methodology and Project Design

This project is a quality improvement project which aims to improve patient outcomes after robotic surgery and uses a retrospective descriptive design. Data were gathered on patients who meet specific criteria and underwent robotic ERP procedures from May 1st, 2023 to August 31st, 2023. The variables analyzed are NSAID administration, serum creatinine levels, and AKI occurrence based on creatinine levels. Additional data gathered were dose administered, patient age, sex, surgical service, procedure, and procedure length in minutes. The data gathered were compared by difference in serum creatinine levels to determine the incidence of AKI. Data analysis was performed using logistic regression to test the degree to which AKI was influenced by age, sex, procedure time and NSAID dose.

Setting

The patients included in the project will be adults undergoing robotic ERP procedures at Atrium Health Carolinas Medical Center (CMC). Atrium Health CMC is a Level 1 Trauma center serving the large urban city of Charlotte, North Carolina. In 2018, 43% of CMC patients came from Mecklenburg County, and 57% came from surrounding counties (Atrium Health, 2019). In 2018, there were 38 operating rooms at AH CMC Main, including four dedicated C-section rooms and one trauma room.

There were 43,331 surgeries performed at AH CMC and AH Mercy in 2018, averaging 833 operations per week (Atrium Health, 2019). In the AH CMC operating rooms, 41.8% of the patients were racial and ethnic minorities, and 26.7% were elderly (Atrium Health, 2019). In the operating rooms, 7% of the patients were self-pay, 28.2% paid with Medicare, 18.9% paid with Medicaid, and 42.8% paid using private insurance (Atrium Health, 2019).

Sample

The sample was obtained from the electronic health record. Eligible records included adult patients 18 years and older who had normal preoperative creatinine function, received an intraoperative NSAID, and were undergoing planned robotic ERP procedures at AH CMC. The sample was obtained from electronic health records from May 2022 through August 2022. Thirty-five patients met the sampling criteria. The surgical services included hepatobiliary, gynecologic, thoracic, and gastrointestinal procedures. Patients in the sample needed to be admitted for at least one night to obtain a postoperative creatinine level. Patients with pre-existing kidney disease, urologic procedures, outpatient robotic ERP procedures, procedures converting to an open surgery, and emergent procedures were excluded from the sample.

Measurement Tools

The measures used in the project were physiologic measures captured from the electronic health records that include serum creatinine and intraoperative NSAID administration. All patients will have received an NSAID. The creatinine level will serve as the measure of AKI postoperatively. Measurement of AKI will follow the KDIGO guidelines, which state AKI as an increasing serum creatinine ≥0.3 mg/dL in 48 hrs or urine output <0.5 mL/kg/hr 6-12 hrs. Urine output may not be accurately tracked postoperatively; thus, only creatinine level will be used. Creatinine level within the 48-hour postoperative period will serve as the measure of AKI.

The clinical question is whether intraoperative NSAID administration is associated with increasing serum creatinine levels and therefore an increased incidence of AKI. Retrospective data from the electronic health record were used to assess NSAID administration, pre and postoperative creatinine levels, sex, age, surgical service, and procedure length in minutes. The difference in creatinine level obtained within the 48-hour postoperative period to the preoperative level will determine if AKI is present.

Data Collection

Data collection occurred retrospectively using the electronic health record at Atrium Health. Atrium Health converted to a new electronic health record in April of 2022, accessible data was available after April 2022. The data champion created a database from the Anesthesia Record Registry, which was then edited by the project coordinator to meet sample criteria. The dataset was filtered using the following steps

- All surgeries from May 1st, 2022 to August 31st, 2022.
- Anesthesia departments CMCV Anesthesia OR and CMC OR
- Service area Atrium Health

- Operating rooms with robotic equipment and capabilities.
- Patient age over 18 years old
- Surgical services: Cardiothoracic, Cardiovascular, General, Obstetrics/Gynecology, thoracic, vascular
- A multimodal analgesia management filter was used to determine the use of enhanced recovery protocols.

Data Management and Confidentiality

The data obtained from electronic health records was de-identified and transferred to a password protected Microsoft Excel sheet for analysis. The data collection sheet can be found in Appendix C. The password fit the standards for account passwords accepted by UNC Charlotte. The data were only available to the project director, coordinator, and statistician. The project was submitted and reviewed by the Institutional Review Board and determined to be a quality improvement project that required no further approval. The UNC Charlotte Institutional Review Board letter can be found in Appendix A and the Atrium Health Wake Forest letter can be found in Appendix B.

Data Analysis

Data analysis was performed using logistic regression to test the degree to which AKI was influenced by age, sex, procedure time and NSAID dose. The data analysis was performed by a committee member specializing in data analytics. Patients with missing preoperative and postoperative serum creatinine results were not included. The descriptive demographic analysis evaluated the mean and standard deviation for patient ages, preoperative serum creatinine, postoperative serum creatinine, NSAID dose administration, and procedure length. Additional analysis specific to sex and surgical service were also included.

CHAPTER 4: RESULTS

Data analysis is based on a sample size of 35 patients. The sample consists of adults ages 18 or older undergoing robotic, ERP surgery at Atrium Health Carolinas Medical Center from May 1st, 2022, through August 31st, 2022, had preoperative and postoperative creatinine levels, received an intraoperative NSAID and a preoperative glomerular filtration rate (GFR) greater than 60.

All 35 patients in the sample underwent thoracic surgery. Twelve of the 35 patients (34%) were male. The mean age was 59.86 years old (*SD* = 13.59). Nine patients were age 30-54 years old. Twenty-six patients were greater than 55 years old (Figure 1).

The average procedure time was 117.40 minutes (*SD* = 40.03). The average NSAID dose was 26.14 mg (*SD* = 6.65). Five (14.29%) individuals developed AKI. Logistic regressions tested the degree to which AKI was influenced by age, sex, procedure time and NSAID dose. AKI did not significantly differ by age (b = .05, p = .227), sex (b = -.84, p = .477), procedure time (b = -.01, p = .608), or NSAID dose (b = -.12, p = .079). Table 1 displays the description analysis and comparison between patients who had an AKI and those that did not.

Figure 1. *Descriptive analysis and comparison between no AKI and AKI patients*

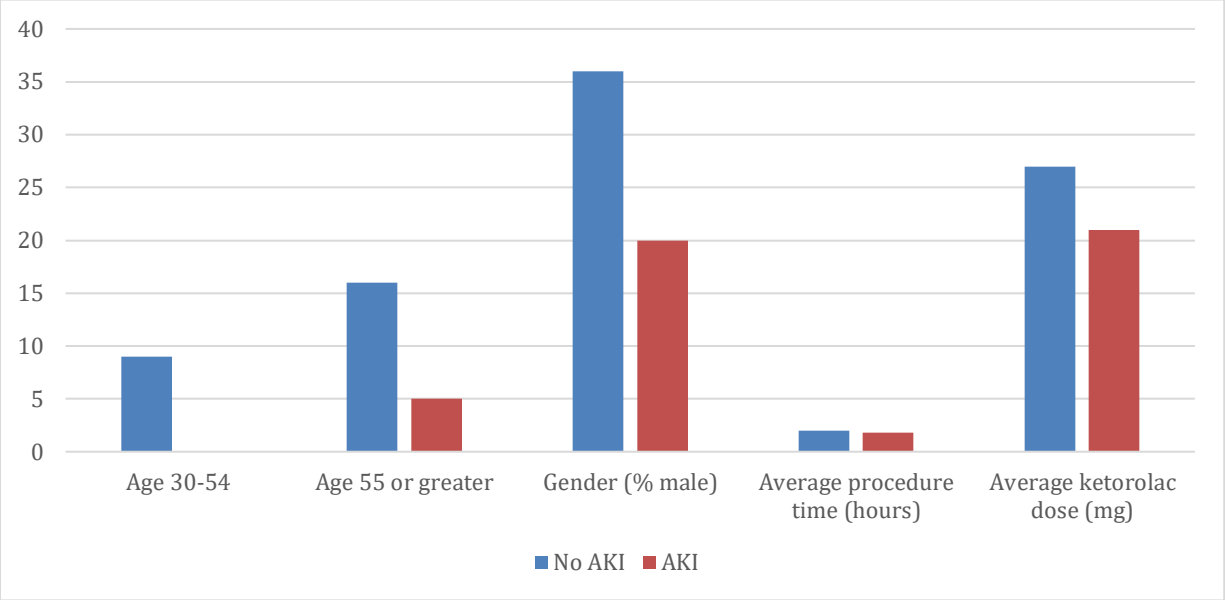

Table 1. *Descriptive analysis and comparison between no AKI and AKI patients*

	No AKI (n = 30) M	AKI (n = 5) M	p-value
Age	58.7 ± 13.84	66.8 ± 10.50	p = .227
Sex (% of male)	n = 36.7%	n = 20.0%	p = .477
Procedure time (minutes)	118.8 ± 42.79	109 ± 15.62	p = .608
Ketorolac dose (mg)	27 ± 6.10	21 ± 8.22	p= .079

CHAPTER 5: DISCUSSION

Implications

This project aimed to explore the incidence of AKI within the 48-hour postoperative period following intraoperative NSAID administration. There were five patients that developed AKI. While these findings were not statistically significant, there is some clinical significance in the findings. The five patients that developed AKI were all over the age of 55, with the oldest patient being 82 years old. Four out of five AKI patients were female. Three out of the five received a 15 mg dose of ketorolac, the other two received a 30 mg dose. The average procedure duration was shorter for the AKI group at 109 minutes. The most significant finding from these data was the age range differences. The overall mean age differed with 59.86 years old (*SD* = 13.59) in the non-AKI group and 66.8 years old in the AKI injury group. These findings are consistent with the literature that identifies age as a risk factor (Zorrilla-Vaca et al., 2020). Consideration of the patient's age when determining AKI risk factors has substantial clinical significance.

To the degree that this project was able to describe the relationships, age appears to be an important variable as anesthesia providers develop a plan of care for patients. Future projects could focus on reducing other risk factors such as hypotension and NSAID dose administration in older patients. NSAID administration was not related to AKI in this project. However, because of the low incidence of patients developing AKI and lower doses of NSAID given, a relationship was not found in this sample. Further projects focused on dosage and age over a greater time period may help clarify potential practice or policy implications for preventing AKI in robotic surgeries.

Limitations and Strengths

This was a quality improvement project that aimed to assess the relationship of factors related to AKI development in patients undergoing robotic ERP surgery. The impetus of the project is specific to a hospital's need to address AKI as a complication that exceeds its outcomes benchmark. The most evident limitation of this project was the lack of comparison between a group receiving NSAIDs and a group not receiving them. Due to time limitations and changes to the hospital system's electronic health record there were significant limitations in the data gathering phase. Surgical data were only available starting with May 2022. Interestingly, all the patients underwent thoracic procedures, and the lack of abdominal and other procedures was an important limitation. In this service line there are multimodal pain management protocols which include the NSAID administration in some, but not all patients. Additionally, patient comorbidities that could influence the risk of AKI were not examined in this study. Hospital specific case reports and demographics were from 2018 and published in 2019, prior to the COVID-19 pandemic. Data were manually gathered through electronic health record reviews and could be limited by human error.

This project was part of a larger project exploring other factors that are reported in separate papers. Other AKI variables of stroke volume variation and hypotension were not evaluated with this sample. There was a gynecologic robotic surgery that was not included in the dataset as it was the only case of varying surgical service and was an outlier. Some records were not included because of the lack of preoperative or postoperative creatinine values. Several patients were excluded due to pre-existing chronic or acute kidney disease. Currently, there is no protocol or standard guiding creatinine assessment or NSAID administration. Urologic or

prostate robotic surgeries were not included because of their direct involvement with the renal system and its inherent risk placing patients at an increased risk of AKI.

Recommendations

Recommendations for NSAID administration and AKI based on this project are not supported at this time. Clinically relevant findings show that there is a possibility that patients greater than 55 years of age are at greater risk of AKI, even with reduced NSAID doses. Recommendations for future projects should focus on NSAID administration in older patients but must also focus on other important contributors to AKI such as hypotension and stroke volume. Expanding the project to include patient comorbidities and past medical history would also be helpful to include in a future quality improvement project aimed at reducing AKI.

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APPENDIX A: UNC Charlotte Institutional Review Board letter

UNIVERSITY OF NORTH CAROLINA CHARLOTTE | DIVISION OF RESEARCH

To:	Ana Arias University of North Carolina at Charlotte
From:	Office of Research Protections and Integrity
Date:	27-Jul-2022
RE:	Determination that Research is not Human Subjects and does not require IRB Approval
Study #:	IRB-23-0030
Study Title:	Enhanced Recovery After Robotic Surgery & Acute Kidney Injury

This submission was reviewed by the Office of Research Protections and Integrity, which has determined that this submission does not constitute human subjects as defined under federal regulations 45 CFR 46.102(e) and 21 CFR 56.102(e) and does not require IRB approval.

Study Description:
This quality improvement (QI) project was chosen by the Safety and Quality Coordinator for the Anesthesia Department at Atrium Health (AH) Main facility. This project will look specifically at factors leading to acute kidney injury (AKI) in robotic surgeries with early recovery after surgery (ERAS) protocols at AH Main. In 2018, AKI was the most common complication in colorectal and abdominal surgeries at AH Main, and the fourth most common complication in gynecologic surgeries. The three team members will each be looking at a specific variable that could be affecting AKI development. The variables being examined are stroke volume variation (SVV), hypotension, and non-steroidal anti-inflammatory (NSAID) administration. These variables were chosen because they are all within the control of the anesthesia provider during the perioperative period. This QI project uses a retrospective, correlational design. Data will be collected via electronic health record (EHR) review and stored in the RedCap secure database. Patients will be deidentified in RedCap- medical record number (MRN), name, and any other identifying information will not be stored. The data that will be recorded is patient age, patient gender, surgical procedure, preoperative creatinine value, postoperative creatinine value, average SVV, minutes with MAP <65, and NSAID dose administered. The comparison of preoperative creatinine and postoperative creatinine will be used to determine if an AKI occurred within the 48-hour postoperative period.

Please be aware that approval may still be required from other relevant authorities or "gatekeepers" (e.g., school principals, facility directors, custodians of records), even though IRB approval is not required.

If your study protocol changes in such a way that this determination will no longer apply, you should contact the above IRB before making the changes.

APPENDIX B: Atrium/ Wake Forest Institutional Review Board letter

MEMORANDUM

To: Elena Meadows
Clinical and Translational Science Institute {CTSI}

From: Jeannie Sekits, Senior Protocol Analyst
Institutional Review Board

Date: 7/12/2022

Subject: Not Human Subjects Research: IRB00086555
Enhanced Recovery after Robotic Surgery & Acute Kidney Injury

The Wake Forest University School of Medicine Institutional Review Board has reviewed your protocol and determined that it does not meet the federal definition of research involving human subject research as outlined in the federal regulations 45 CFR 46. 45 CFR 46.102(f) defines human subjects as "a living individual about whom an investigator (whether professional or student) conducting research obtains (1) data through intervention or interaction with the individual, or (2) identifiable private information."

The information you are receiving is not individually identifiable. In recent guidance published by the Office of Human Research Protections (OHRP) on the Guidance on Research Involving Coded Private Information or Biological Specimens, OHRP emphasizes the importance on what is being obtained by the investigator and states "if investigators are not obtaining either data through intervention or interaction with living individuals, or identifiable private information, then the research activity does not involve human subjects."

Note that only the Wake Forest University School of Medicine IRB can make the determination for its investigators that a research study does not meet the federal definition of human subject research. Investigators do not have the authority to make an independent determination that a study does not meet the federal requirements for human subject research. Each project requires a separate review and determination by the Board. The Board must be informed of any changes to this project, so that the Board can determine whether it continues to not meet the federal requirements for human subject research. If you have any questions or concerns about this information, please feel free to contact our office at 716-4542.

APPENDIX C: Data Collection Sheet

Patient	Surgical Service	Surgical procedure	Age	Sex	Procedure length (min)	Preoperative creatinine	Postoperative creatinine	Creatinine difference	NSAID dosage	AKI (Y/N)
1										
2										
3										
4										

APPENDIX D: Timeline