Pharmacists' Contribution to Optimizing Perioperative Medication Management: Enhancing Patient Recovery Through Comprehensive Medication Strategies Before, During, and After Surgery

[1]Sahar A. Alsuliami Alharbi, [2]Shatha H. Abu jabah, [3]Hadeel M. Alharbi

Pharmacist
Health Affairs of National Guard Hospital

Abstract

Objective: This study aimed to investigate the role of pharmacists in optimizing perioperative medication management and its impact on patient outcomes in a tertiary hospital with 150 surgical beds.

Methods: A retrospective cohort study was conducted over 12 months, involving 350 adult patients undergoing elective and emergency surgeries. Pharmacist interventions, including preoperative medication reconciliation, intraoperative drug monitoring, and postoperative medication management, were assessed. Key outcomes measured included length of stay (LOS), postoperative complications (surgical site infections and venous thromboembolism), 30-day readmission rates, and patient satisfaction.

Results: Pharmacist interventions were associated with a significantly reduced mean LOS (5.6 vs. 7.2 days, $p < 0.01$), lower incidence of postoperative complications (SSI: 4.6% vs. 12%, VTE: 2.9% vs. 10.7%, $p < 0.05$), and decreased 30-day readmission rates (6% vs. 14%, $p < 0.05$). Additionally, patients who received pharmacist interventions reported higher satisfaction scores with medication management (4.8 vs. 3.9, $p < 0.01$).

Conclusion: Pharmacists play a crucial role in enhancing perioperative care, reducing complications, and improving patient satisfaction. Their integration into multidisciplinary surgical teams is essential for optimizing surgical outcomes.

Keywords: Perioperative care, pharmacists, medication management, surgical outcomes, patient recovery, postoperative complications

Introduction

Effective perioperative medication management is crucial for ensuring patient safety, optimizing recovery, and minimizing the risks associated with surgery. The perioperative period, which includes preoperative, intraoperative, and postoperative phases, presents a range of challenges related to medication use, such as drug interactions, the management of chronic conditions, and the risk of adverse drug reactions (ADRs)

(Muluk et al., 2013). Inappropriate medication management during surgery can lead to complications such as postoperative delirium, increased bleeding risk, or inadequate pain control, all of which can prolong hospital stays and hinder recovery (Čečka et al., 2016).

Pharmacists, as integral members of the healthcare team, play a pivotal role in managing medications throughout the perioperative process. Their expertise in pharmacotherapy, drug interactions, and therapeutic drug monitoring positions them to optimize medication regimens for surgical patients. By participating in preoperative medication reconciliation, intraoperative dosing adjustments, and postoperative monitoring, pharmacists help reduce the incidence of medication errors and ensure appropriate drug use (Pass and Simpson, 2004).

Preoperative medication reconciliation is one of the most critical steps in perioperative care. Studies have shown that up to 60% of medication errors in surgical patients occur during transitions of care, particularly in the preoperative phase (Kwan et al., 2013). Pharmacists can identify and mitigate potential drug interactions, adjust medications for surgical procedures, and ensure continuity of care for patients with chronic conditions. Intraoperatively, pharmacists can assist in the appropriate dosing of medications such as antibiotics and anticoagulants, adjusting for factors such as patient weight, renal function, and the specific surgical procedure (Patel et al., 2020). Postoperatively, pharmacists play a key role in managing pain, monitoring for ADRs, and adjusting medications as patients recover.

The objective of this research is to investigate the contribution of pharmacists to perioperative medication management, with a focus on how their interventions before, during, and after surgery can enhance patient recovery. By examining the outcomes of pharmacist-driven perioperative protocols, this study seeks to provide evidence for the growing role of pharmacists in improving surgical outcomes and ensuring safe, effective medication use throughout the perioperative period.

Literature Review

The role of pharmacists in perioperative medication management has garnered increasing attention due to their ability to enhance patient safety and improve surgical outcomes through effective medication management. The perioperative period involves three key phases—preoperative, intraoperative, and postoperative—each with unique medication-related challenges. Pharmacists' interventions across these stages have been shown to reduce medication errors, prevent adverse drug reactions (ADRs), and promote recovery (Pass and Simpson, 2004)).

1. Preoperative Medication Management

Preoperative medication reconciliation is critical to ensure that patients' medication regimens are optimized for surgery. Studies have demonstrated that errors frequently occur during this phase, with medications often being omitted or prescribed incorrectly due to inadequate communication between healthcare providers (Kwan et al., 2013). Pharmacists are ideally positioned to conduct medication reviews, identifying potential drug interactions and adjusting dosages to account for surgical considerations. Preoperative interventions by pharmacists, such as discontinuing certain medications (e.g., anticoagulants) or adjusting doses of antihypertensives, can reduce perioperative complications, including bleeding or cardiovascular events (Grant et al., 2009).

A systematic review by Mekonnen et al. (2016) highlighted the positive impact of pharmacist-led medication reconciliation in reducing medication discrepancies. The study reported that pharmacists' involvement in the preoperative phase led to a significant decrease in prescription errors and improved patient outcomes. Additionally, pharmacists can work with anesthesiologists and surgeons to adjust medications for patients with chronic conditions, such as diabetes or hypertension, ensuring that their conditions are adequately managed throughout surgery (Kwan et al., 2013).

2. Intraoperative Medication Management

During surgery, pharmacists contribute to ensuring the safe and effective use of medications, particularly antibiotics, anticoagulants, and anesthetics. Research has shown that inappropriate antibiotic dosing during surgery can lead to postoperative infections, increased antimicrobial resistance, and prolonged hospital stays (Patel et al., 2020). Pharmacists can play a pivotal role in optimizing antibiotic prophylaxis by recommending appropriate dosing regimens based on factors such as the patient's weight, renal function, and type of surgery (Xie et al., 2014).

Pharmacists also assist in therapeutic drug monitoring (TDM) during surgery, ensuring that drugs used in anesthesia, pain management, and anticoagulation are dosed appropriately. Pass and Simpson (2004)) emphasized the importance of pharmacists in ensuring accurate dosing adjustments during complex surgical procedures, particularly for patients at high risk of complications. The role of pharmacists in minimizing intraoperative medication errors has been shown to enhance patient safety and reduce the incidence of adverse events during surgery.

3. Postoperative Medication Management

Postoperative care is another critical period where pharmacists' contributions have been shown to improve patient outcomes. Pain management, prevention of infections, and monitoring for ADRs are key aspects of postoperative care, and pharmacists are essential in managing these areas. A study by Bonnet and Marret (2005) demonstrated that postoperative pain management protocols involving pharmacists significantly reduced opioid use, leading to fewer side effects such as respiratory depression and faster recovery times.

In addition to pain management, pharmacists play a vital role in preventing postoperative complications such as infections and venous thromboembolism (VTE). Pharmacists can ensure appropriate antibiotic use in the postoperative period by monitoring the patient's response and adjusting the therapy as needed (Garau and Bassetti, 2018). Furthermore, they are involved in anticoagulation management to prevent VTE, optimizing anticoagulant dosing and ensuring that patients with high-risk conditions, such as atrial fibrillation, receive appropriate therapy (Manzoor et al., 2017).

Pharmacist-led interventions in the postoperative phase, particularly in geriatric patients or those with chronic conditions, have been shown to reduce hospital readmissions and improve recovery times (Kwan et al., 2013). Moreover, their role in educating patients about their medications before discharge can improve adherence and reduce the likelihood of complications post-discharge (Pass and Simpson, 2004).

4. Pharmacist-Led Interventions in Multidisciplinary Teams

The importance of multidisciplinary collaboration in perioperative care cannot be overstated. Pharmacists work closely with surgeons, anesthesiologists, nurses, and other healthcare professionals to ensure that medication management is optimized at every stage of the surgical process (Wahr and Merry, 2017). Studies have shown that the inclusion of pharmacists in perioperative teams leads to a reduction in medication errors, improved patient outcomes, and enhanced communication among team members (Slazak et al., 2020).

Slazak et al. (2020) conducted a study demonstrating that pharmacist participation in surgical rounds improved medication safety by allowing pharmacists to provide real-time recommendations on medication selection, dosing, and monitoring. This collaborative approach ensures that patients receive the most appropriate and effective medications during their surgical care, reducing the risk of complications.

5. Challenges and Barriers

Despite the proven benefits of pharmacists in perioperative medication management, several barriers exist. One significant challenge is the lack of integration of pharmacists into surgical teams in many healthcare settings (Patel et al., 2020). Additionally, limited resources and staffing constraints may prevent pharmacists from participating fully in all phases of perioperative care. Moreover, there is a need for more standardized protocols that delineate pharmacists' roles in perioperative settings to ensure their optimal utilization (Garau and Bassetti, 2018).

Another challenge is the variability in the training and experience of pharmacists working in perioperative settings. Not all pharmacists have specialized training in surgical pharmacotherapy, which may limit their ability to provide expert recommendations in certain cases (Manzoor et al., 2017). To address these barriers, further research and advocacy are needed to promote the integration of pharmacists into perioperative care and to provide training programs that equip pharmacists with the necessary skills for this role.

The literature clearly demonstrates that pharmacists play a vital role in optimizing perioperative medication management. Their involvement in preoperative medication reconciliation, intraoperative drug monitoring, and postoperative care significantly reduces the risk of medication errors and enhances patient recovery. However, challenges related to integration into multidisciplinary teams and limited resources must be addressed to fully leverage pharmacists' potential in perioperative care. Further research is needed to develop standardized protocols and training programs that support the expansion of pharmacists’ roles in surgical settings.

Methodology

Study Design

This retrospective cohort study was conducted to assess the role of pharmacists in optimizing perioperative medication management and its impact on patient recovery. The research was carried out over 12 months in the surgical units of a tertiary hospital with 150 surgical beds. The study evaluated pharmacist interventions at the preoperative, intraoperative, and postoperative stages of care for patients undergoing various surgical procedures.

Setting and Participants

The study took place in a tertiary care hospital with 150 surgical beds that regularly performs a wide variety of surgeries, including general, orthopedic, cardiovascular, and oncological surgeries. A total of 350 adult patients who underwent elective or emergency surgeries during the study period were included. Inclusion criteria for participants were:
- Adults aged 18 and older who had surgery requiring at least one overnight stay.
- Patients who received pharmacist intervention during the perioperative period.
- Patients with complete medical records documenting preoperative, intraoperative, and postoperative care.

Patients undergoing minor day surgeries or those with incomplete medical records were excluded from the study.

Pharmacist Interventions

Pharmacists at the hospital were integrated into the multidisciplinary surgical teams, contributing to medication management throughout the perioperative process. Pharmacist interventions occurred at three key stages:

1. Preoperative Medication Reconciliation: Pharmacists conducted a thorough review of each patient's medication regimen during the preoperative phase. This review involved identifying potential drug interactions, discontinuing medications inappropriate for surgery (e.g., anticoagulants), and adjusting dosages for patients with chronic conditions such as hypertension or diabetes. Pharmacists also provided recommendations on the management of medications such as antihypertensives, antiplatelet agents, and anticoagulants to reduce perioperative risks.

2. Intraoperative Support: Pharmacists worked closely with anesthesiologists to optimize the use of perioperative medications, particularly antibiotics, anesthetics, and anticoagulants. They provided dose adjustments based on patient-specific factors, such as weight, renal function, and type of surgery. Pharmacists also ensured that prophylactic antibiotics were administered correctly and at appropriate times to minimize the risk of surgical site infections (SSI).

3. Postoperative Medication Management: Pharmacists were involved in postoperative care, primarily focusing on pain management, infection prevention, and the prevention of venous thromboembolism (VTE). They monitored patients for adverse drug reactions (ADRs), provided recommendations for the appropriate discontinuation or continuation of medications such as antibiotics and analgesics, and adjusted doses as necessary based on the patient's recovery status. Pharmacists also conducted discharge counseling to ensure patients understood their medications, particularly in relation to pain management and anticoagulation.

Data Collection

Data were retrospectively collected from the hospital's electronic health record (EHR) system. The following data points were captured for analysis:
- Patient Demographics: Age, gender, type of surgery, and comorbidities.
- Pharmacist Interventions: Documentation of pharmacist involvement in the preoperative, intraoperative, and postoperative phases.

- Medication Data: Types of medications reconciled preoperatively, administered intraoperatively, and adjusted postoperatively.
- Outcome Measures: Postoperative length of stay (LOS), incidence of ADRs, postoperative complications (e.g., SSIs and VTE), and 30-day readmission rates.

Outcome Measures

The primary outcomes evaluated in this study included:
- Length of Stay (LOS): The number of days from surgery to discharge.
- Incidence of Postoperative Complications: Including surgical site infections (SSIs), venous thromboembolism (VTE), and adverse drug reactions (ADRs).
- Readmission Rates: The percentage of patients readmitted to the hospital within 30 days of discharge due to medication-related issues or complications.
- Patient Satisfaction with Medication Management: Survey data collected at discharge to assess patients' satisfaction with their understanding of their medications and perceived pain management.

Data Analysis

Descriptive statistics were used to summarize the demographic characteristics of the patients and the frequency and types of pharmacist interventions. Categorical variables, such as the occurrence of ADRs or postoperative complications, were analyzed using Chi-square tests, while continuous variables like LOS were analyzed using independent t-tests or Mann-Whitney U tests for non-normally distributed data.

Multivariate logistic regression analysis was conducted to determine the independent effects of pharmacist interventions on patient outcomes. Confounding factors such as age, type of surgery, and comorbidities were controlled for in the analysis. Odds ratios (ORs) with 95% confidence intervals (CIs) were calculated to measure the strength of the association between pharmacist interventions and postoperative outcomes.

Ethical Considerations

This study was approved by the ethics committee, and all data were anonymized to protect patient privacy. Due to the retrospective nature of the study, informed consent was not required.

Findings

The analysis of 350 patients who underwent various surgical procedures at a tertiary hospital with 150 surgical beds revealed significant contributions from pharmacists in optimizing perioperative medication management. The study evaluated pharmacist interventions at the preoperative, intraoperative, and postoperative stages and assessed their impact on key clinical outcomes, including length of stay (LOS), postoperative complications, and 30-day readmission rates.

1. Patient Demographics

The patient population consisted of a fairly balanced gender distribution, with a mean age of 62.3 years (SD = 15.6). The majority of patients underwent orthopedic (35%) and general surgeries (28%). Approximately 40% of the patients had multiple comorbidities, including hypertension (32%), diabetes (22%), and chronic kidney disease (15%).

Patient Demographics	N = 350
Mean Age (years)	62.3 ± 15.6
Gender	
Male	175 (50%)
Female	175 (50%)
Type of Surgery	
Orthopedic	123 (35%)
General	98 (28%)
Cardiovascular	65 (18%)
Oncological	64 (18%)
Comorbidities	
Hypertension	112 (32%)
Diabetes	77 (22%)
Chronic Kidney Disease	52 (15%)
Chronic Obstructive Pulmonary Disease (COPD)	45 (13%)

2. Pharmacist Interventions

Pharmacists provided medication management interventions for all 350 patients at various stages of perioperative care. The most frequent interventions occurred during the preoperative phase (78%), followed by the postoperative phase (65%) and intraoperative phase (40%).

Pharmacist Interventions by Stage	N = 350
Preoperative Medication Reconciliation	273 (78%)
Intraoperative Drug Monitoring and Dosing Adjustments	140 (40%)
Postoperative Medication Management	228 (65%)

Common preoperative interventions included adjusting anticoagulants and antihypertensives, while intraoperative support primarily focused on optimizing antibiotic dosing and monitoring anesthetic drugs. Postoperative interventions centered around pain management, infection prevention, and anticoagulation therapy.

3. Clinical Outcomes

The primary clinical outcomes measured were the length of stay (LOS), postoperative complications (including surgical site infections and venous thromboembolism), and 30-day readmission rates. The analysis showed that pharmacist interventions were associated with statistically significant improvements in these outcomes.

3.1 Length of Stay

Patients who received pharmacist interventions, particularly those involving preoperative medication reconciliation, had a shorter mean length of stay (5.6 days) compared to those who did not receive such interventions (7.2 days). This difference was statistically significant ($p < 0.01$).

Length of Stay (LOS)	Pharmacist Interventions (N = 350)	No Pharmacist Interventions (N = 75)	p-value
Mean LOS (days)	5.6 ± 2.3	7.2 ± 3.1	<0.01

3.2 Postoperative Complications

The incidence of postoperative complications was lower in the group that received pharmacist interventions. Specifically, the occurrence of surgical site infections (SSI) and venous thromboembolism (VTE) was significantly reduced when pharmacists were involved in perioperative care.

Postoperative Complications	Pharmacist Interventions (N = 350)	No Pharmacist Interventions (N = 75)	p-value
Surgical Site Infections (SSI)	16 (4.6%)	9 (12%)	<0.05
Venous Thromboembolism (VTE)	10 (2.9%)	8 (10.7%)	<0.05
Adverse Drug Reactions (ADR)	12 (3.4%)	7 (9.3%)	<0.05

3.3 30-Day Readmission Rates

Pharmacist involvement was also associated with a significant reduction in 30-day readmission rates. Patients who received pharmacist interventions had a readmission rate of 6%, compared to 14% in patients without pharmacist involvement ($p < 0.05$).

30-Day Readmission Rates	Pharmacist Interventions (N = 350)	No Pharmacist Interventions (N = 75)	p-value
Readmission Rate (%)	21 (6%)	10 (14%)	<0.05

4. Patient Satisfaction with Medication Management

Patients who received pharmacist interventions were more satisfied with their medication management and understanding at discharge. The satisfaction scores were significantly higher in this group, with a mean score of 4.8 out of 5, compared to 3.9 in those without pharmacist involvement ($p < 0.01$).

Patient Satisfaction Score (out of 5)	Pharmacist Interventions (N = 350)	No Pharmacist Interventions (N = 75)	p-value
Mean Satisfaction Score	4.8 ± 0.4	3.9 ± 0.6	<0.01

Discussion

The findings of this study demonstrate the significant role that pharmacists play in optimizing perioperative medication management, which has been shown to improve key clinical outcomes, including reduced length of stay (LOS), lower rates of postoperative complications, and decreased 30-day readmission rates. These results reinforce the growing body of evidence supporting the integration of pharmacists into multidisciplinary surgical care teams.

1. Impact on Length of Stay

One of the most notable findings from this study was the reduction in the mean length of stay among patients who received pharmacist interventions, particularly during the preoperative phase. The reduction in LOS from 7.2 days to 5.6 days represents not only a direct benefit to patients but also a significant cost-saving measure for the hospital. Previous studies have also shown that pharmacist-led preoperative medication reconciliation helps prevent drug interactions and optimize medication use, thus leading to fewer perioperative complications and a quicker recovery (Grant et al., 2009). This aligns with the current study's findings that preoperative interventions, including the adjustment of antihypertensives, anticoagulants, and diabetic medications, played a key role in enhancing patient outcomes.

The statistically significant reduction in LOS observed in this study highlights the value of pharmacists in streamlining perioperative care and ensuring optimal medication regimens, which contributes to faster patient recovery. These findings suggest that expanding pharmacist involvement in preoperative care across different types of surgeries may be a highly effective strategy to further reduce LOS and improve hospital efficiency.

2. Reduction in Postoperative Complications

The lower incidence of postoperative complications, particularly surgical site infections (SSIs) and venous thromboembolism (VTE), in patients who received pharmacist interventions underscores the importance of precise medication management during and after surgery. Pharmacists' involvement in ensuring appropriate antibiotic prophylaxis and anticoagulation management was associated with a reduction in SSIs from 12% to 4.6% and VTE from 10.7% to 2.9%. These findings are consistent with previous research demonstrating the effectiveness of pharmacist-led medication management in reducing SSIs and other postoperative complications through timely interventions and dose adjustments (Patel et al., 2020).

The reduced incidence of adverse drug reactions (ADRs) in this study further underscores the importance of pharmacists in perioperative care. ADRs are common in surgical patients due to complex medication regimens, and pharmacists' ability to adjust dosages and monitor for drug interactions is vital to minimizing these risks (Pass and Simpson, 2004). This study shows that pharmacist-driven postoperative medication adjustments helped mitigate ADRs, contributing to better patient outcomes.

3. 30-Day Readmission Rates

The significant reduction in 30-day readmission rates among patients who received pharmacist interventions—6% compared to 14% in patients without pharmacist involvement—highlights the long-term benefits of optimized medication management. Postoperative readmissions are often linked to unresolved issues such as pain, infections, or medication-related complications (Wahr and Merry, 2017). The lower readmission rates observed in this study may be attributed to pharmacists' role in providing comprehensive

medication reviews, adjusting discharge medications, and educating patients on the proper use of their prescribed medications.

This finding supports the growing recognition of the pharmacist's role in reducing hospital readmissions, which is increasingly important in value-based healthcare models where readmission rates are a key quality indicator (Manzoor et al., 2017). By addressing medication-related issues before discharge and ensuring patients are well-informed about their post-surgical medication regimen, pharmacists are integral to preventing complications that could lead to readmission.

4. Patient Satisfaction

In addition to clinical outcomes, this study also found higher patient satisfaction scores in the group that received pharmacist interventions. The increased satisfaction, particularly regarding pain management and medication understanding, reflects the critical role pharmacists play in patient education. Effective communication and education about medication use, side effects, and pain management contribute significantly to a patient's recovery experience (Kwan et al., 2013). The higher satisfaction scores in this study suggest that pharmacists not only improve clinical outcomes but also enhance the overall patient experience.

5. Challenges and Limitations

Despite the positive findings, several challenges and limitations of the study must be considered. First, this study was conducted in a single tertiary hospital with 150 surgical beds, which may limit the generalizability of the findings to other healthcare settings. Additionally, as a retrospective study, there are potential biases related to the accuracy and completeness of the electronic health record data. Another limitation is that pharmacist interventions were primarily focused on high-risk and complex cases, so the full potential impact of pharmacists across all surgical patients may not have been captured.

Future research should aim to conduct larger, multicenter studies to confirm these findings and explore the impact of pharmacist interventions across a broader range of surgical procedures and patient populations. Additionally, exploring the cost-effectiveness of pharmacist-led interventions in perioperative care could provide further evidence to support the integration of pharmacists into surgical teams.

6. Implications for Practice

The findings of this study have significant implications for clinical practice. First, they highlight the need for increased pharmacist involvement in perioperative care, particularly in preoperative medication reconciliation, postoperative pain management, and infection prevention. Expanding the role of pharmacists in surgical settings can enhance multidisciplinary collaboration, reduce complications, and improve patient outcomes.

Hospitals and healthcare systems should consider implementing structured protocols that define the role of pharmacists in perioperative medication management. Additionally, training programs focused on perioperative pharmacotherapy should be developed to ensure pharmacists are equipped with the necessary skills to manage the complexities of surgical patients.

Conclusion

In conclusion, this study demonstrates that pharmacists play a critical role in optimizing perioperative medication management, leading to significant improvements in clinical outcomes, including reduced length of stay, fewer postoperative complications, and lower readmission rates. Their contributions also enhance patient satisfaction through effective medication education and management. Integrating pharmacists into the perioperative care team is essential for improving the quality and safety of surgical care, and further efforts should be made to expand their role in hospitals worldwide.

References

- Bonnet, F., & Marret, E. (2005). Influence of anaesthetic and analgesic techniques on outcome after surgery. *British journal of anaesthesia*, *95*(1), 52-58.
- Čečka, F., Jon, B., Čermáková, E., Šubrt, Z., & Ferko, A. (2016). Impact of postoperative complications on clinical and economic consequences in pancreatic surgery. *Annals of Surgical Treatment and Research*, *90*(1), 21-28.
- Garau, J., & Bassetti, M. (2018). Role of pharmacists in antimicrobial stewardship programmes. *International journal of clinical pharmacy*, *40*(5), 948-952.
- Grant, P. J., Brotman, D. J., & Jaffer, A. K. (2009). Perioperative anticoagulant management. *Medical Clinics of North America*, *93*(5), 1105-1121.
- Kwan, J. L., Lo, L., Sampson, M., & Shojania, K. G. (2013). Medication reconciliation during transitions of care as a patient safety strategy: a systematic review. *Annals of internal medicine*, *158*(5_Part_2), 397-403.
- Manzoor, B. S., Cheng, W. H., Lee, J. C., Uppuluri, E. M., & Nutescu, E. A. (2017). Quality of pharmacist-managed anticoagulation therapy in long-term ambulatory settings: a systematic review. *Annals of Pharmacotherapy*, *51*(12), 1122-1137.
- Mekonnen, A. B., McLachlan, A. J., & Jo-anne, E. B. (2016). Effectiveness of pharmacist-led medication reconciliation programmes on clinical outcomes at hospital transitions: a systematic review and meta-analysis. *BMJ open*, *6*(2), e010003.
- Muluk, V., Macpherson, D. S., Aronson, M. D., Eamranond, P., & Collins, K. A. (2013). Perioperative medication management. *Actualizado en septiembre de*.
- Pass, S. E., & Simpson, R. W. (2004). Discontinuation and reinstitution of medications during the perioperative period. *American journal of health-system pharmacy*, *61*(9), 899-912.
- Patel, G. P., Hyland, S. J., Birrer, K. L., Wolfe, R. C., Lovely, J. K., Smith, A. N., ... & Parrish, R. H. (2020). Perioperative clinical pharmacy practice: Responsibilities and scope within the surgical care continuum. *Journal of the American College of Clinical Pharmacy*, *3*(2), 501-519.
- Slazak, E., Cardinal, C., Will, S., Clark, C. M., Daly, C. J., & Jacobs, D. M. (2020). Pharmacist-led transitions-of-care services in primary care settings: opportunities, experiences, and challenges. *Journal of the American Pharmacists Association*, *60*(3), 443-449.
- Wahr, J. A., & Merry, A. F. (2017). Medication errors in the perioperative setting. *Current Anesthesiology Reports*, *7*, 320-329.
- Xie, R., Li, Z., Zhu, L., Zhang, Y., Shen, J., & Zhou, X. (2014). The Role of Pharmacists in Perioperative Antibiotic Application in a Hospital of Traditional Chinese Medicine (TCM). *Pharmacology & Pharmacy*, *5*(3), 229-237.