

Preventive Medication After Surgery and Its Role in Medication Management and Use (MMU): An AI-Assisted Scientific Review

Saeed Saad Saeed Al Nabet Al Shahrani¹, Norah Sulaiman Alsuhaihani², Rahaf Fahad Alosaimi³, Turki Zaid Alozayb⁴, Rasha ali alsarh, Pharmacist⁵, Abdullah S. Alabdullah⁶, Nawaf Awadh Saeed Alqahtani⁷, Mohammed Hassan Mahzari⁸

¹Armed Forces Hospitals Program in the South, Khamis Mushait, Pharmacy Technician. Email: sweed.s9994@gmail.com

²AFHSR, Pharmacist. Email: Nourasuhaihani@yahoo.com

³Armed Forces Hospital, Southern Region, City- Khamis Mushayt, Saudi Arabia. IV pharmacist.

Email address- rhv252@gmail.com

⁴PSMMC, Pharmacist Healthcare Quality Improvement, Riyadh. Email address- turki.zaid@gmail.com

⁵Armed Forces Hospital, Abha. Email: Ph.rasha@hotmail.com

⁶Consultant of Restorative Dentistry, King Faisal Medical city, Abha KSA. Email: doctor-abdullah@hotmail.com

⁷Dentist, Khamis mushait hospital, Khamis moshait. Email: Nawaf24.1990@gmail.com

⁸Health Education specialis, Prince Sultan Military Medical City, Riyadh. Email: imhmahzari@gmail.com

ABSTRACT

Postoperative preventive medication is a cornerstone of patient safety and quality of care. Effective Medication Management and Use (MMU) systems ensure that prophylactic therapies—such as antibiotics, anticoagulants, analgesics, and antiemetics—are selected, prescribed, dispensed, administered, and monitored appropriately. This paper provides an expanded review of preventive medication use after surgery, emphasizing MMU standards, risk mitigation, interdisciplinary roles, and AI-assisted optimization strategies. Evidence-based practices and structured monitoring tools are presented to enhance outcomes and reduce postoperative complications.

KEYWORDS: Preventive medication, postoperative care, MMU, patient safety, antimicrobial prophylaxis, AI in healthcare.

How to Cite: Saeed Saad Saeed Al Nabet Al Shahrani, Norah Sulaiman Alsuhaihani, Rahaf Fahad Alosaimi, Turki Zaid Alozayb, Rasha ali alsarh, Pharmacist, Abdullah S. Alabdullah, Nawaf Awadh Saeed Alqahtani, Mohammed Hassan Mahzari, (2025) Preventive Medication After Surgery and Its Role in Medication Management and Use (MMU): An AI-Assisted Scientific Review, Vascular and Endovascular Review, Vol.8, No.20s, 149-151

INTRODUCTION

Surgical patients are at increased risk of complications including surgical site infections (SSIs), venous thromboembolism (VTE), pain-related morbidity, nausea, and stress ulcers. Preventive medications play a vital role in minimizing these risks. However, inappropriate medication use can lead to adverse drug events (ADEs), antimicrobial resistance, bleeding, and increased length of stay.

Medication Management and Use (MMU) standards provide a structured framework to ensure safe, effective, and rational use of medications throughout the perioperative period.

MEDICATION MANAGEMENT AND USE (MMU) FRAMEWORK

MMU encompasses the full medication lifecycle:

1. Selection and procurement
2. Prescribing and transcribing
3. Preparation and dispensing
4. Administration
5. Monitoring and evaluation

In postoperative care, MMU emphasizes standardization, clinical protocols, interdisciplinary collaboration, and continuous quality improvement.

CATEGORIES OF PREVENTIVE MEDICATIONS AFTER SURGERY

Table 1. Common Preventive Medications Used Postoperatively

Medication Category	Purpose	Examples	Key Risks
Antibiotics	Prevent SSIs	Cefazolin, Cefuroxime	Resistance, allergy
Anticoagulants	Prevent VTE	Enoxaparin, Heparin	Bleeding
Analgesics	Pain prevention	Paracetamol, NSAIDs	Renal/GI effects
Antiemetics	Prevent nausea/vomiting	Ondansetron	QT prolongation
Stress ulcer prophylaxis	Prevent GI bleeding	PPIs, H2 blockers	Infections, overuse

ANTIMICROBIAL PROPHYLAXIS AND STEWARDSHIP

Appropriate antibiotic prophylaxis requires:

- Correct drug selection
- Proper timing (usually within 60 minutes before incision)
- Limited duration (generally ≤ 24 hours post-surgery)

Overuse or prolonged prophylaxis increases antimicrobial resistance and *Clostridioides difficile* infection.

Table 2. Best Practices for Surgical Antibiotic Prophylaxis

Parameter	Recommended Practice
Timing	30–60 minutes before incision
Duration	Single dose or ≤ 24 hours
Selection	Based on procedure and local antibiogram
Monitoring	Allergy status, renal function

VENOUS THROMBOEMBOLISM (VTE) PROPHYLAXIS

Postoperative immobility significantly increases VTE risk. Pharmacological prophylaxis should be individualized based on bleeding risk, age, and comorbidities.

Table 3. VTE Risk Stratification and Prophylaxis

Risk Level	Patient Characteristics	Recommended Prophylaxis
Low	Minor surgery, mobile	Early ambulation
Moderate	Major surgery	LMWH or UFH
High	Cancer, obesity, prior VTE	LMWH + mechanical methods

PAIN, NAUSEA, AND GASTROINTESTINAL PROPHYLAXIS

Multimodal analgesia reduces opioid use and related adverse effects. Antiemetics and GI prophylaxis should be used selectively to avoid unnecessary exposure.

ROLES AND RESPONSIBILITIES IN MMU

Table 4. Interdisciplinary Roles in Postoperative Preventive Medication

Role	Responsibility
Surgeon	Define prophylaxis indication and duration
Pharmacist	Review orders, dosing, interactions
Nurse	Safe administration and monitoring
Quality Team	Audit compliance and outcomes
Infection Control	Monitor SSI rates

AI AND DIGITAL SUPPORT IN MMU

Artificial intelligence can enhance MMU by:

- Clinical decision support for drug selection and dosing
- Alerts for duplicate therapy or prolonged prophylaxis
- Predictive analytics for VTE and SSI risk
- Automated audits and compliance dashboards

QUALITY INDICATORS AND MONITORING

Table 5. Key Performance Indicators (KPIs) for Preventive Medication Use

Indicator	Target
Appropriate antibiotic timing	$\geq 95\%$
Antibiotic duration ≤ 24 hrs	$\geq 90\%$
VTE risk assessment documented	100%
Postoperative ADE rate	↓ annually

DISCUSSION

Effective preventive medication use after surgery requires strict adherence to MMU standards, continuous education, and system-based controls. AI-driven tools provide opportunities to reduce human error and enhance compliance, but must be integrated with clinical judgment and governance frameworks.

CONCLUSION

Preventive medications are essential in postoperative care, but their benefits depend on safe and rational use. A robust MMU system—supported by interdisciplinary collaboration and AI technologies—can significantly reduce complications, improve patient outcomes, and meet international accreditation standards.

REFERENCES

1. World Health Organization. WHO Guidelines for Safe Surgery.
2. Joint Commission International (JCI). Medication Management and Use Standards.
3. ASHP. Clinical Practice Guidelines for Antimicrobial Prophylaxis in Surgery.
4. Kohn LT et al. To Err Is Human. National Academies Press.
5. Institute for Safe Medication Practices (ISMP). Medication Safety in Acute Care.
6. Institute of Medicine (IOM). Kohn LT, Corrigan JM, Donaldson MS. To Err Is Human: Building a Safer Health System. Washington, DC: National Academies Press; 2000.
7. Agency for Healthcare Research and Quality (AHRQ). Preventing Adverse Drug Events in Hospitals. Rockville, MD; 2021.
8. European Centre for Disease Prevention and Control (ECDC). Systematic Review and Evidence-Based Guidance on Perioperative Antibiotic Prophylaxis. Stockholm; 2019.
9. Australian Commission on Safety and Quality in Health Care. Antimicrobial Stewardship in Acute Care. Sydney; 2021.
10. Gan TJ, et al. Consensus Guidelines for the Management of Postoperative Nausea and Vomiting. *Anesth Analg*. 2020;131(2):411–448.
11. Chou R, et al. Management of Postoperative Pain: A Clinical Practice Guideline. *J Pain*. 2016;17(2):131–157.
12. Bates DW, et al. The Impact of Computerized Physician Order Entry on Medication Error Prevention. *J Am Med Inform Assoc*. 1999;6(4):313–321.
13. Topol EJ. High-Performance Medicine: The Convergence of Human and Artificial Intelligence. *Nat Med*. 2019;25:44–56.
14. Yu KH, et al. Artificial Intelligence in Healthcare. *Nat Biomed Eng*. 2018;2:719–731.
15. van Klei WA, et al. Effects of Decision Support on Appropriate Prophylactic Antibiotic Use. *BMJ Quality & Safety*. 2012;21(8):648–655.