RESEARCH PAPER

Drug Utilization Patterns in Emergency Laparotomy Patients: A Systematic Review

Dr Priyanka Pendyala[1] , Dr G Muralidharan[2] , Dr Boddu Sai Kruthik[3], Dr Grace Blessina[4]

[1]Surgical Resident, Shri Sathya Sai Medical college and Research Institute, Sri Balaji Vidyapeeth (Deemed to be University), 76-8/4-9a , popurivari street , Bhavanipuram , Vijayawada , krishna district, Andhra Pradesh 520012 , ORCID iD: 0009-0000-4854-5067, drpriyankapendyala@gmail.com

[2]HOD and Professor , Shri Sathya Sai Medical college and Research Institute , Sri Balaji Vidyapeeth (Deemed to be University) , Orcid id : 0000-0002-2598-4670 , mmcmad81@gmail.com

[3]Surgical Resident , Shri Sathya Sai Medical college and Research Institute , Sri Balaji Vidyapeeth (Deemed to be University) , 8-2-48/5,opp.panthugari meda,old gajuwaka, Visakhapatnam,Andhra radesh-530026 , Orcid id : 0009-0004-6796-5154 , kruthik.boddu@gmail.com

[4]Surgical Resident ,Shri Sathya Sai Medical college and Research Institute , Sri Balaji Vidyapeeth (Deemed to be University) , T19, 19031, Prestige Bella Vista, Chennai 600056 , Orcid id : 0009-0007-1051-1233 , drgraceblessina@gmail.com

***Abstract**:* Emergency laparotomy is a risky operation that is commonly conducted in case of acute abdominal issues (i.e. perforation, obstruction of the intestines, trauma and sepsis in the abdomen). Pharmacologically treating these patients with critical illness is crucial to ensuring that they have a better postoperative recovery and fewer complications. This review paper assesses the scenario of the use of the drugs in patients with laparotomy in emergency situations with the emphasis on the trends of prescription; taking of antibiotics, analgesics, supportive interventions, and rational use of medications. Electronic databases, such as PubMed, Scopus, Web of Science, and Google Scholar, were used to analyse relevant studies that were published between 2015 and 2026. The results indicated that antibiotics were the most prescribed drugs, especially cephalosporins with metronidazole. The concept of multimodal analgesia that included the use of the opioid and non-opioid analgesics was extensively used in pain treatment. Proton pump, anticoagulants and intravenous fluids were also used as supportive therapies. Nevertheless, the issues of polypharmacy, long-term antibiotic use, and irrational ways of prescribing drugs were discovered. The importance of antimicrobial stewardship, prescribing based on evidence and multidisciplinary perioperative care is highlighted in the review to optimise patient outcomes.

Keywords: Emergency laparotomy, Drug utilization, Antibiotic stewardship, Perioperative pharmacotherapy, Polypharmacy

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I. INTRODUCTION

One of the most urgent surgery procedures, which is realized in emergency departments and tertiary healthcare facilities, is emergency laparotomy. It is usually used as the treatment of life-threatening conditions of the abdomen that include perforation peritonitis, intestinal obstruction, abdominal trauma, ischemic bowel disease, intra-abdominal sepsis and complicated appendicitis [1]. The emergency laparotomy in patients is usually associated with an increased morbidity, mortality, postoperative infection, extended hospitalisation, and intensive care unitisation relative to elective surgical patients because of the urgency of the procedures. High quality perioperative pharmacological management can thus be important to stabilise a patient, complications and enhance clinical outcomes [2]. Drug utilization studies: Drug utilization studies represent useful types of tools in assessing the trends of prescribing, the appropriateness of drugs in healthcare systems and rational use of drugs. When a laparotomy is performed in emergency cases, various medications are oftentimes administered in the preoperative, intraoperative and postoperative stages. This consists of antibiotics, analgesics, proton pump inhibitors, antiemetics, anticoagulants, intravenous fluids, vasopressors as well as nutritional supplements. Antimicrobial agents are one of these with a

significant portion of treatment since intra-abdominal infections and septic complications are very common in emergency surgery [3]. Nevertheless, irrational prescribing patterns that might lead to adverse drug reactions, antimicrobial resistance, rising treatment and health care expenditures and unfavorable patient recovery can include excessive polypharmacy, inappropriate mixes of antibiotics, prolonged antimicrobial therapy, and being indiscriminate about using broad-spectrum medications.

The effectiveness, safety and quality of the pharmacotherapy used by managing emergency laparotomy can be learned by systematic review of the drug utilization patterns. It can also be used to determine lapses in the observance of the standard treatment guidelines and antimicrobial stewardship guidelines. The knowledge of prescribing behaviour in healthcare workers may assist in evidence based interventions that will help improve medication use and health safety of patients. Thus, the systematic review will focus on reviewing literature available on this topic with specific interest in commonly prescribed drugs, change in antibiotic usage patterns, analgesic treatment of the patient, supportive therapy, and any factor that may play roles in prescribing behaviours in emergency surgical care.

II. RELATED WORKS

The recent literature has emphasised the increasing significance of the optimisation of using perioperative drugs and supportive management among emergency patients of abdominal surgery. Some studies have been conducted on the areas of infection control, trauma treatment, analgesic therapy, fluid therapy, and antimicrobial stewardship, which have an immediate impact on the drug prescription pattern during an emergency laparotomy. In one of their studies, Hasamnis et al. [15] used a prospective study that involved the review of clinical outcomes of critically ill obstetrics patients in a tertiary care centre in India. This paper revealed that severely sick operating and emergency patients often need regular pharmacological treatment that involves antibiotics, vasopressors, painkillers, anticoagulants, and fluid replacement treatment. Results highlighted the significance of evidence-based management of drugs in minimising mortality and postoperative complications. Holmes et al. [16] explored the applicability of focused abdominal sonography in patients with trauma and emphasized that blunt trauma in the abdomen presents with an increasing number of patients which would need emergency surgery. Their research supported the importance of swift choice making and timely delivery of antimicrobials, analgesics, and supportive drugs when dealing with patients of emergency abdominal surgery.

Howroyd et al. [17] overviewed trauma-related respiratory complications and found pneumonia as one of the significant postoperative issues in patients with critically injured patients. The authors mentioned that increased antimicrobial resistance is caused by prolonged stay in hospitals and extensive exposure to antibiotics, and suggested rational use of antibiotics in emergency surgeries. The other study by Hu et al. [18] investigated the processes and treatment regimens, relating to acute pancreatitis, which is a significant indication of emergency laparotomy in the severe situation. The review demonstrated the importance of fluid resuscitation, pain, anti-inflammatory treatment and prevention of infection as key components of enhancing clinical outcomes. Likewise, the authors Ioana et al. [19] spoke about the progress made in treating acute necrotizing pancreatitis and emphasized that multidisciplinary pharmacological management is needed, which consists of broad-spectrum antibiotics, nutritional support, and monitoring of intensive care. Jansen et al. [20] reviewed the trauma resuscitation guidelines and discussed the importance of haemodynamic stabilisation by balance transfusion practices and managing fluids in operating theatre trauma surgery. Their results echoed the increased use of protocol-based perioperative management approaches in order to enhance patient survival.

Khan et al. [21] examined the anti-inflammatory and immunomodulatory effect of statins, and their impact on the pathways of inflammation, including NF- 2-kB and regulation of cytokines. The researchers postulated that the anti-inflammatory pharmacological agents could be of therapeutic possibility in the future to reduce the postoperative inflammatory complications and recovery time after the major abdominal surgery. Kölukcuk et al. [22] computed ultrasound-guided transversus abdominis plane block timing in laparoscopic surgery and discovered regional analgesic methods that considerably enhanced postoperative pain and decreased the use of opioids. These results justify the use of multimodal analgesia approaches that are up-and-coming in abdominal surgery. Lorente et al. [23] have also questioned practices on perioperative fluid therapy in adults and children and emphasized the significance of making the right choice on the selection of fluids, electrolytes and haemodynamics in the emergency operations. The authors have alluded that in order to curb postoperative organ dysfunction and surgical complications, rational fluid administration is necessary.

The article by Lunda et al. [24] examined the pattern of mortality at tertiary hospitals and referenced delayed interventions, complications due to infection and poor critical care support as top causes of poor surgical outcomes. Their results obliquely stressed the

importance of pharmacological interventions and postoperative monitoring in patients that undergo the emergency laparotomy. Mašić et al. [25] investigated the adaptive responses in the gut microbiota and gut-liver damage during sepsis, showing that the impact of systemic infection can affect postoperative complications and inflammatory processes. The research supported the significance of specific antimicrobial therapy and infection prevention in highly sick patients in the operating room. Massimo et al. [26] thoroughly overviewed antibiotic treatment of intra-abdominal infection and pointed out modern guidelines on the choice of antibiotics, on the length of treatment, and on antimicrobial stewardship. The paper was a strong recommendation to rational use of antibiotics in the management of multidrug resistance in an effort to ensure that the outcome of emergency patients in abdominal surgery is best optimized.

In general, the literature reviewed confirms the idea that the management of emergency laparotomy presupposes the extensive pharmacological treatment including antibiotics, analgesics, fluid therapy, and the critical care. The papers all point to the significance of rational drug use, antimicrobial stewardship, multimodal pain management and evidence-based perioperative care as approaches to enhance patient outcomes and minimize complications in the context of emergency surgical cases.

III. METHODS AND MATERIALS

The systematic review was aimed to evaluate and synthesise available evidence about drug utilisation patterns among the patients who participate in emergency laparotomy. The methodology was developed using the general guidelines of systematic review research to make the findings transparent, reproducible and reliable. The aim of the review was to examine prescribing habits, regularly used drugs, intake of antimicrobials, analgesics, supportive therapy and sensible prescription of drugs, in emergency surgical units [4].

3.1 Research Design

The current research used a systematic review methodology to review existing literature with a critical approach in connection with the pharmacology of emergency laparotomy patients. The reason why systematic review approach was chosen is that through systematic review approach it is possible to have a wide range of identification, assessment of research evidence along with synthesis of evidence identified after reviewing various clinical studies. The review sought to establish trends in medication use, as well as, determine the suitability of therapeutic interventions adopted in managing clients in perioperative and postoperative processes [5].

The methodology used in the review process included the stated objectives of the research, the search strategies, finding of research related materials, screening of those based on eligibility criteria, extraction of the data, quality evaluation, and synthesis of findings in narrative form [6]. To eliminate bias and maximise scientific validity, the approach used was based on principles of structured reporting.

3.2 Research Questions

The following research questions increased the systematic review:

1. What are the common drugs that are mostly prescribed to patients of emergency laparotomy?
2. What trends in the use of antibiotics in the treatment of emergency laparotomy are present?
3. What are the uses of analgesic and supportive drugs in the course of perioperative treatment?
4. How rational and irrational prescribing are affected by factors in emergency laparotomy patients?
5. What are the key consequences linked with existing trends in drug use?

3.3 Data Sources and Search Strategy

To find the useful literature based on the patterns of drug use during emergency laparotomy, a literature search was performed with the use of several electronic databases covering the research of peer-reviewed articles released over the past several years. The databases used were:

- PubMed
- Scopus
- Web of Science
- Google Scholar
- ScienceDirect
- SpringerLink

The search spanned a period of 2015-26 years of the published studies in order to capture both the recent and clinically pertinent evidence. Search accuracy and comprehensiveness were enhanced using keywords, Medical Subject Headings (MeSH) and Boolean operators [7].

The major search terms included:

- “Emergency laparotomy”
- “Drug utilization”
- “Medication prescribing patterns”
- “Antibiotic utilization”
- “Perioperative pharmacotherapy”
- “Analgesic use in abdominal surgery”
- “Emergency abdominal surgery”
- “Antimicrobial stewardship”
- “Postoperative medication management”
- “Polypharmacy in surgical patients”

Search terms were effectively combined with the help of Boolean operators, including AND, OR, and NOT. The selection of studies reference lists were also sifted

manually to find additional relevant publications that might have not been identified in the electronic search.

Table 1: Database Search Strategy

Database	Search Terms Used	Time Period
PubMed	"Emergency laparotomy" AND "drug utilization"	2015–2026
Scopus	"Antibiotic prescribing" AND "abdominal surgery"	2015–2026
Web of Science	"Perioperative pharmacotherapy" OR "emergency surgery drugs"	2015–2026
Google Scholar	"Medication patterns in emergency laparotomy patients"	2015–2026
Science Direct	"Analgesic use in emergency abdominal surgery"	2015–2026
SpringerLink	"Antimicrobial stewardship in laparotomy"	2015–2026

3.4 Inclusion and Exclusion Criteria

There were special selection requirements to make sure that suitable and quality studies pertinent to the research aims were selected.

Inclusion Criteria

The studies that were to be included needed to:

- Specializes in patients of emergency laparotomy.
- Assessed prescription or use of drugs.
- Self-reported use of antibiotics, analgesic or supportive medicine.
- Observational studies, retrospective studies, prospective studies or clinical audits?
- Were published in peer-reviewed journals
- Were available in English language
- Published after the year 2015 and up to 2026.

Exclusion Criteria

Studies were chosen out on the basis of:

- With the sole aim of elective surgeries.
- Failed to give adequate pharmacological information.
- Were opinion papers, conferences abstracts, Opinions or letters editorials.
- Included children populations alone.
- Were duplicate studies
- Was missing or unavailable entire text data.

The inclusion and exclusion criteria ensured that there was uniformity and relevancy in the selection process.

3.5 Study Selection Process

In the study selection, a multi-stage study was done to make sure that all relevant literature was identified systematically. To begin with, all the records detected during database searches were exported to reference management software and duplicate articles were eliminated.

The initial level of screening was done by screening titles and abstracts to ascertain its relevance to the research objectives. At this step studies that were not relevant to emergency laparotomy or the use of drugs were filtered out. The predefined inclusion and exclusion criteria were applied to evaluate the potential relevance of the full-text articles of potentially eligible studies in the second step [8].

The final review incorporated studies that had all the requirements to be included in the review. Screening was done to make sure that synthesised studies were high in quality and clinically relevant and so as to include only high quality and clinically significant studies in the review.

3.6 Data Extraction

To extract the valuable data in the systematic manner, a structured data extraction form was created to retrieve the relevant data in each of the studies included [9]. Data extraction was done with a lot of caution to reduce errors and so as to allow uniformity in studies.

The information that has been extracted entailed:

- Author and publication year
- Country of study
- Study design
- Sample size
- Patient characteristics
- Type of emergency laparotomy
- Commonly prescribed medications
- Antibiotic utilization patterns
- Analgesic utilization patterns
- Supportive drug therapy
- Duration of treatment
- Clinical outcomes
- Adverse drug reactions
- Key conclusions

The data acquired were tabularised and summarised in narratives to be compared with one another.

Table 2: Data Extraction Variables

Variables	Description
Author and Year	Name of study authors and publication year

Country	Geographical location of study
Study Design	Prospective, retrospective, or observational
Sample Size	Number of participants included
Surgical Indications	Conditions requiring emergency laparotomy
Antibiotic Usage	Types and combinations of antibiotics prescribed
Analgesic Usage	Pain management medications administered
Supportive Therapy	PPIs, anticoagulants, antiemetics, IV fluids
Treatment Duration	Duration of medication administration
Clinical Outcomes	Infection rates, recovery, complications, mortality
Adverse Drug Reactions	Drug-related complications reported

3.7 Quality Assessment

Standard critical appraisal techniques were used to determine the quality of methodology of the studies included. Observational and retrospective did not differ in the quality of the study designs, adequacy of the sample, clarity of the objectives, methods of collecting data, statistical analysis, and reporting transparency [10].

Articles having significant methodological shortcomings, lack, or high risk of bias were thoroughly screened prior to being included. The quality evaluation enhanced validity and reliability of the findings of the systematic review.

3.8 Data Synthesis and Analysis

The findings were analysed and summarised through a narrative synthesis approach due to the diversity in design and patient groups, prescribing use, and the outcome measurement in encompassing the studies. The quantitative meta-analysis was not done as all studies were not heterogeneous.

The data analysis aimed at determining recurring themes and patterns of the prescription of emergency laparotomy in the settings. The classes of drugs were classified into antibiotics, analgesics, gastrointestinal protective drugs, anticoagulants, antiemetics, intravenous fluids, and supportive drugs [11]. Comparative assessment was carried out with an aim of establishing frequent prescribed medications, trends of polypharmacy, medication adherence as well as prescription rationality.

Resultations were interpreted in connection with the principles of antimicrobial stewardship, patient safety, and optimisation of perioperative pharmacotherapy. The effectiveness of the use of medication in influencing postoperative complications, hospital stay, infection control, and the final clinical outcome was also reviewed.

3.9 Ethical Considerations

This study did not entail any ethical approval since it was purely founded on existing literature. Nevertheless, academic integrity, transparency, appropriate referencing to the sources were upheld in the review process [12]. To prevent any plagiarism and to guarantee scientific quality, all the works, which were included, were duly recognized.

3.10 Limitations of the Methodology

There are some restrictions that were determined in the review process. English-only publications were incorporated in the review; this might have resulted in the omission of any other publications on the same topic that have been published in different languages. The difference between the methods of prescriptions, hospital environments and the methods of studying, limited accurate comparison of studies. Also, other studies were small samples, and did not fully report adverse drug reactions or long-term outcomes. Nevertheless, in spite of such restrictions, systematic review presents extensive evidence about the current trends in the use of drugs in the emergency laparotomy patients and reveals the aspects that need new clinical researches and optimisation of the pharmacotherapy practices.

IV. RESULTS AND ANALYSIS

The systematic review analyzed published articles that investigated the use of drugs among patients who underwent emergency laparotomy. The incorporated studies together had a common factor that patients of emergency laparotomy are subjected to all forms of pharmacological treatment because of the severity of their ailments, the risk of infection, postoperative pain, gastrointestinal disorders and haemodynamic instability [13]. Patterns of drug use differed among the settings but a number of general patterns of prescribing were prevailing.

It was discovered that antibiotics, analgesics, proton pump inhibitors (PPIs), antiemetics, anticoagulants, intravenous fluids and nutritional supplements were the most commonly ordered types of therapeutic agents. The foundation of treatment was broad-spectrum antimicrobial therapy due to the contamination, perforation, or intra-abdominal

infection being part of most emergency laparotomy procedures. Other issues noted in the review are related to polypharmacy, long-term antimicrobial use, irrational prescribing, and adherence to the antimicrobial stewardship recommendations.

4.1 Characteristics of Included Studies

The research in the review study was primarily prospective observational studies, retrospective studies, and assessment of drug use in hospitals. The majority of studies were done in tertiary centres where abdominal surgeries were done as often as emergency treatments. The size of samples used in the studies and number of patients differed greatly as some had small groups of less than 100, and others were large reviews involving hundreds of surgical cases [14].

Figure 1: "Common Drug Classes Used in Emergency Laparotomy Patients"

Most of the indications of emergency laparotomy were perforation peritonitis, intestinal obstruction, appendicular perforation, abdominal trauma, mesenteric ischemia, and bowel gangrene. Older patients showed increased medication needs and postoperative complications and patients with multiple comorbidities.

Table 3: Characteristics of Included Studies

Study Type	Number of Studies	Common Focus Areas
Prospective Observational	8	Antibiotic and analgesic prescribing
Retrospective Studies	6	Postoperative medication trends
Drug Utilization Reviews	5	Polypharmacy and rational prescribing
Clinical Audits	4	Antimicrobial stewardship compliance
Comparative Studies	3	Surgical outcomes and medication use

This analysis revealed that the most commonly used ones were prospective observational studies due to the ability to directly evaluate medication prescribing behaviour in the context of perioperative management.

4.2 Antibiotic Utilization Patterns

Antibiotics were noted to be the most commonly prescribed of medications in emergency laparotomy patients. Virtually all the incorporated studies found regular use of empirical broad-spectrum antibiotic therapy just prior to surgery and its administration during the postoperative period [27]. The extensive use of antibiotics was a sign of the high rates of intra-abdominal sepsis, perforation, contamination and postoperative infection in emergency cases of surgery. Ceftriaxone and cefotaxime were the third-generation cephalosporins most commonly used antibiotics. Metronidazole was also used in almost all cases with cephalosporins to give anaerobic coverage. It was more widely used in the place of the narrow spectrum antimicrobials in critically-ill patients or patients with septic shock since it had a broader spectrum.

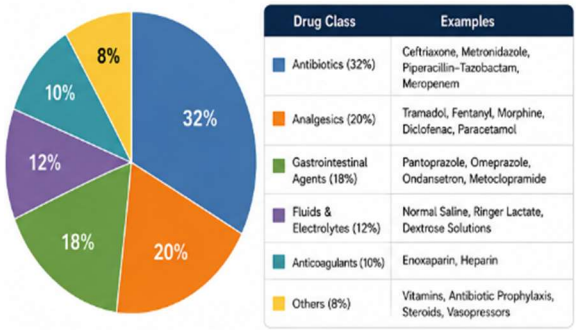

Figure 2: "Antibiotic Utilization Patterns in Emergency Laparotomy Patients"

Nevertheless, many studies got irrational prescribing antibiotic use practices that consisted of combination therapy based on unnecessaryness, longer therapy period than it is recommended and absence of a culture-led de-escalation. A lot of abuse of broad-spectrum antibiotics also added to the issue of antimicrobial resistance.

Table 4: Commonly Prescribed Antibiotics in Emergency Laparotomy

Antibiotic Class	Common Drugs Used	Major Indications

Cephalosporins	Ceftriaxone, Cefotaxime	Peritonitis, bowel perforation
Nitroimidazoles	Metronidazole	Anaerobic infection coverage
Penicillin Combinations	Piperacillin-Tazobactam	Severe intra-abdominal sepsis
Carbapenems	Meropenem, Imipenem	Multidrug-resistant infections
Aminoglycosides	Amikacin, Gentamicin	Gram-negative bacterial infections
Fluoroquinolones	Ciprofloxacin, Levofloxacin	Secondary infection management

In the review, combination antibiotic therapy was also found to be more prevalent in comparison to monotherapy. The frequency of prescription led to ceftriaxone with metronidazole being the most common, and its affordability combined with a broad antimicrobial spectrum and universal availability in tertiary care centers.

Sometimes poor antimicrobial stewardship practices were also observed in a number of studies. Test culture sensitivity was not done promptly or even at all resulting in the clinicians persisting with empirical therapy treatment. The practice cost more in terms of treatment and enhanced the threat of a resistant strain of bacteria [28].

4.3 Analgesic Utilization Patterns

The other significant aspect of perioperative pharmacotherapy was the management of pain in patients undergoing emergency laparotomy. The review revealed that multimodal analgesia methods were being increasingly embraced to enhance the postoperative recovery and to reduce the side effects of the opioids.

The most common medications were nonsteroidal anti-inflammatory drugs (NSAIDs), paracetamol, and opioid painkillers. The most common agents of opioid were tramadol and fentanyl which were used to manage moderate and severe postoperative pain. Intravenous opioid administration was favored in critically ill patients because it has a fast onset of action besides being able to provide pain control.

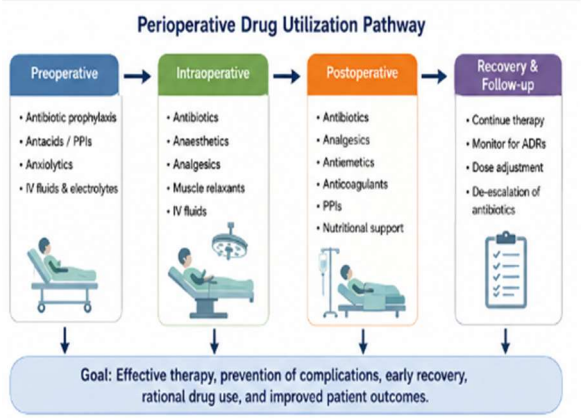

Figure 3: "Perioperative Drug Administration Timeline in Emergency Laparotomy"

Even though opioids were found to be used as effective analgesics, multiple studies had concerns about excessive use of opioids, respiratory depression, sedation, nausea, constipation and delayed mobilisation. To curb the opioid dependency, a lot of medical facilities had included multimodal analgesic plans that entailed NSAIDs and acetaminophen combinations.

Table 5: Analgesic Utilization in Emergency Laparotomy Patients

Analgesic Category	Commonly Used Drugs	Purpose
Opioids	Tramadol, Fentanyl, Morphine	Severe postoperative pain
NSAIDs	Diclofenac, Ketorolac	Inflammation and pain reduction
Non-Opioid Analgesics	Paracetamol	Mild to moderate pain
Local Anaesthetics	Bupivacaine	Regional pain management
Combination Therapy	Opioid + NSAID	Multimodal analgesia

The result of the review indicated that multimodal analgesia was indeed a very effective pain management technique that can be used to better manage postoperative pain with fewer opioid-related complications. The previous ambulation and reduced hospital stay in patients who were prescribed multiple lines of analgesics were shown earlier than in the patients who were prescribed opioids only.

4.4 Gastrointestinal Protective Agents and Supportive Therapy

The gastrointestinal protective agents were regularly given to prevent stress related mucosal lesion, gastritis and complications of peptic ulcers caused by surgical stress and long term use of NSAIDs. Pantoprazole and omeprazole are some of the proton pump inhibitors that were extensively used in the preoperative and postoperative stages.

Ondansetron and metoclopramide were often used as antiemetic to treat nausea and vomiting postoperative. Essential components of supportive care also included intravenous fluid therapy, correction of electrolytes, and nutritional supplementation [29].

The use of low-molecular-weight heparin (LMWH) as anticoagulant prophylaxis was widely recommended to help decrease the chance of venous thromboembolism in immobilised post-operative patients. Nevertheless, there was a great difference between different institutions in terms of thromboprophylaxis practices.

Table 6: Frequently Prescribed Supportive Medications

Drug Category	Common Drugs	Clinical Purpose
Proton Pump Inhibitors	Pantoprazole, Omeprazole	Gastric protection
Antiemetics	Ondansetron, Metoclopramide	Prevention of nausea and vomiting
Anticoagulants	Enoxaparin, Heparin	Thromboprophylaxis
Intravenous Fluids	Normal Saline, Ringer Lactate	Fluid and electrolyte balance
Nutritional Supplements	Albumin, Multivitamins	Nutritional recovery support

PPIs use was also linked to the decreased occurrence of gastrointestinal complications though, some studies cautioned that unnecessary and prolonged use of PPI therapy might be hazardous because of risks of Clostridium difficile infection and malabsorption of nutrients.

4.5 Polypharmacy and Rational Drug Use

Polypharmacy was very common among emergency laparotomy cases due to the vastness in handling the patients and comorbidity. A significant number of patients were administered over six medications at a time when they were at hospital. The review pointed out both acceptable and unacceptable types of polypharmacy.

Evidence based application of various drugs as an appropriate polypharmacy to manage infection, pain, fluid imbalance, thrombosis prevention and gastrointestinal protection were appropriate [30]. Conversely, irrational polypharmacy consisted of duplications of antibiotics, unwarranted persistence of drugs, overutilization of injectable drugs, and an absence of dose individualisation.

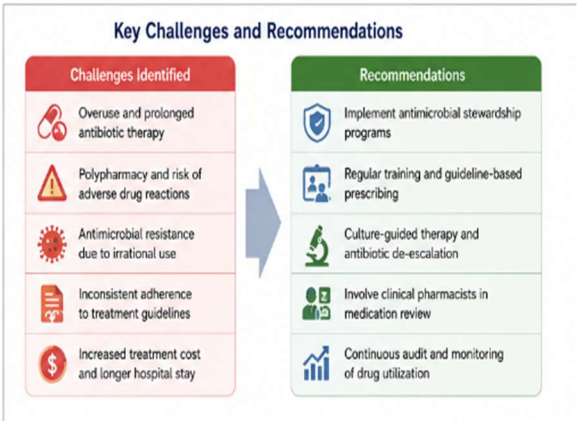

Figure 4: "Key challenges"

It was found in the analysis that the elderly patients were especially prone to adverse drug reactions because of compromised renal performance, modification of the pharmacokinetic processes, and concomitant chronic illnesses. Most of the research studies had medication errors that were related to improper dosing, drug interactions, and incomplete record keeping.

Table 7: Major Drug Utilization Concerns Identified

Drug Utilization Issue	Observed Impact
Prolonged antibiotic therapy	Increased antimicrobial resistance
Excessive opioid administration	Respiratory depression and delayed recovery
Polypharmacy	Higher adverse drug reaction risk
Lack of culture-guided therapy	Irrational antimicrobial use
Inconsistent thromboprophylaxis	Increased thromboembolic complications

Overuse of injectable drugs	Increased healthcare costs

The significance of antimicrobial stewardship and rational prescribing practices were highly stressed in the review. Hospitals with standard treatment measures and multidisciplinary approach to review showed a reduced occurrence of the inappropriate prescribing and enhanced patient outcomes.

4.6 Clinical Outcomes Associated with Drug Utilization

The review found that there were important correlations between patterns of medication use and the postoperative outcomes. Rational antibiotic choice, and prompt management were linked with decreased surgical site infections and mortality. On the same note, patient comfort, early mobilisation and recovery were enhanced with good multimodal analgesia. In contrast, the inappropriateness in the use of medications was linked to a number of adverse clinical outcomes. Long-term use of antibiotics augmented the occurrence of multidrug-resistant organisms. The overuse of opioids led to respiratory dysfunction and gastrointestinal dysfunction. Polypharmacy was a cause of adverse drug reaction and drug-drug interaction.

Some of the studies too, noted that evidence-based prescribing guidelines implementation had led to better medication safety and decreased the length of stay. Antimicrobial stewardship programmes in institutions reported more sensible antibiotic stewardship and decreased resistance trends. The results also indicated the role of pharmacists in perioperative care. Clinical pharmacists helped in drug survey, drug dosage modification, observing any drug reactions, and efficient drug therapy optimization.

4.7 Comparative Analysis of Prescribing Trends

Comparison and conduction across studies indicated the differences in prescribing practice based on healthcare infrastructure, hospital protocol, resources availability and regional trend in antimicrobial resistance. Better compliance with treatment guidelines was observed in tertiary care centres than smaller hospitals. In the developing healthcare sector, the prevailing empirical use of antibiotic therapy was due to limited availability of microbiological testing. Conversely, those hospitals having stewardship programmes in place more often adopted the use of culture-based therapy and antibiotic de-escalation approaches. The review also revealed that it was increasingly adopting enhanced recovery after surgery (ERAS) protocols in certain institutions. Pharmacological interventions using ERAS which aim at reducing opioid consumption, promoting early feeding, decreasing non-indicated intravenous drugs, and advantageous recovery.

In general, the systematic review revealed that there are multidimensional and intricate trends in the use of drugs in emergency laparotomy patients. Although proper pharmacotherapy makes a significant contribution to enhanced surgical outcomes, irrational prescribing behaviors continue to be at the forefront of the challenges that need constant monitoring, stewardship intercessions, clinical education and adoption of evidence-based treatment guidelines.

V. CONCLUSION

The current systematic review demonstrates the important role of pharmacological management in enhancing clinical outcomes of emergency laparotomy patients. The results show that laparotomy in a state of emergency is accompanied by complicated perioperative treatment that involves extensive use of antibiotics, analgesics, gastrointestinal protective drugs, anticoagulants, intravenous fluids, and supportive treatment. Broad-spectrum antibiotics were the most commonly used drugs among them as the incidence of intra-abdominal infections, sepsis, perforation, and postoperative complications are the most common among them.

The review found that combination antibiotic therapy, especially cephalosporins combined with metronidazole continues to achieve the highest prevalence of prescription in emergency surgery setting. The use of multimodal analgesia methods, which included opioids, NSAIDs and non-opioid analgesics, was widely applied in enhancing pain management and reducing the negative effects of opioids. There were, however, a number of issues associated with irrational prescribing, such as long-term use of antibiotics, the use of over-polypharmacy, dependence on injectable drugs, and failure to comply with the given guidelines in antimicrobial stewardship. It was also found that rational drug use, evidence-based prescribing, on-time medication, and multidisciplinary perioperative care play a significant part in minimizing the number of postoperative infections, shortening hospitalization, and enhancing the healing process of patients. Involvement of clinical pharmacist and antimicrobial stewardship programmes were also observed to improve medication safety and its suitability in prescribing. Comprehensively, drug utilization practices in emergency laparotomy patients should be optimized, which can lead to enhanced surgical outcomes, fewer cases of antimicrobial resistance, fewer cases of adverse drug reactions, and safe, cost-effective, and patient-centred perioperative care.

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