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Adverse Drug Reactions And Drug–Drug Interactions Among General Surgical Inpatients: A Prospective Pharmacovigilance And Drug Safety Study.

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Abstract

Background: Adverse drug reactions (ADRs) and drug–drug interactions (DDIs) are important medication-safety concerns among surgical inpatients because of frequent exposure to multiple perioperative medications. Prospective pharmacovigilance can help identify preventable drug-related problems and improve rational prescribing. Aim of the present study was to evaluate the occurrence, pattern, severity and associated risk factors of ADRs and potential DDIs among general surgical inpatients. ***Materials and Methods:*** A prospective observational study was conducted by the Department of Pharmacology in collaboration with the Department of General Surgery at a tertiary care teaching hospital. Seventy-five adult inpatients were monitored from admission to discharge. ADRs were assessed using standard causality, severity and preventability scales, while potential DDIs were identified using standard drug-interaction references. Data were analyzed using descriptive statistics, Chi-square/Fisher's exact test and Spearman correlation. ***Results:*** ADRs occurred in 10 of 75 patients (13.3%), with 12 ADR episodes identified. Most reactions were mild to moderate, and 66.7% were considered potentially preventable. Potential DDIs were detected in 48 patients (64.0%), with moderate interactions predominating. Polypharmacy was significantly associated with DDIs (p=0.030), while older age and emergency admission were significantly associated with ADR occurrence. The number of medications showed a moderate positive correlation with DDI burden (ρ=0.477, p<0.001). ***Conclusion:*** ADRs and potential DDIs are common among general surgical inpatients and are strongly influenced by medication burden. Prospective pharmacovigilance and interdisciplinary medication review may improve drug safety in surgical wards.

Keywords: Adverse drug reactions; Drug–drug interactions; Pharmacovigilance; Polypharmacy; General surgery; Medication safety; Surgical inpatients.

INTRODUCTION

Adverse drug reactions (ADRs) are an important cause of morbidity, prolonged hospitalization and additional healthcare expenditure, and their early recognition remains a fundamental component of pharmacovigilance and patient safety. Hospitalized surgical patients represent a particularly vulnerable population because their pharmacotherapy frequently involves multiple drug classes during the preoperative, perioperative and postoperative periods. In addition to medications used for pre-existing comorbidities, these patients commonly receive antimicrobials, analgesics, opioids, anticoagulants, antiemetics, proton-pump inhibitors, intravenous fluids and other supportive therapies, with anaesthetic agents and perioperative medications further increasing overall drug exposure. Such multidrug therapy increases the probability of both ADRs and drug–drug interactions (DDIs). The Pharmacovigilance Programme of India has strengthened systems for identification and reporting of suspected ADRs; nevertheless, active institutional surveillance remains important because spontaneous reporting alone may fail to detect a substantial proportion of clinically relevant drug-related events [1]. Long-term surveillance from an ADR Monitoring Centre in Central India has similarly demonstrated the continuing importance of systematic assessment of suspected reactions and their causality and severity [2].

Recent studies have highlighted the magnitude of medication-related problems among hospitalized patients. In a prospective study conducted in surgical wards in Gujarat, Gohil et al. monitored 400 patients using a trigger-tool approach and detected 49 ADRs in 43 patients, with an adverse drug-event rate of 12.25 per 100 patients, demonstrating the usefulness of active ADR surveillance in surgical practice [3]. Osanlou et al. reported a substantial burden of ADRs among hospital admissions and demonstrated an important relationship between ADRs, multimorbidity and polypharmacy [4]. Georgiev et al. likewise found that polypharmacy considerably increased the likelihood of potential pharmacokinetic DDIs

among hospitalized patients, particularly when more than seven drugs were prescribed [5]. These observations are relevant to surgical practice because patients may undergo rapid changes in drug therapy around the time of surgery. A recent review by Silva et al. emphasized that perioperative DDIs may involve pharmacokinetic and pharmacodynamic mechanisms and can either increase toxicity or reduce therapeutic efficacy [6]. Furthermore, a meta-analysis by Aksoy and Ozturk reported a pooled prevalence of 64.9% for potential DDIs and 17.17% for clinically evident DDIs among hospitalized patients [7]. Recent multicentre data have also demonstrated that clinically relevant DDIs can result in actual patient harm [8].

Despite these findings, important evidence gaps remain. Much of the available literature evaluates general medical populations, relies on retrospective records or incident-reporting systems, or examines ADRs and DDIs separately. Studies specifically involving surgical patients have identified medication-safety incidents involving opioids, antimicrobials and antithrombotic drugs [9], while a recent retrospective study of elective surgical inpatients found DDIs to be a major cause of drug-related problems [10]. However, prospective studies simultaneously evaluating ADRs and DDIs throughout hospitalization in general surgical patients remain limited, particularly in Indian institutional settings. Therefore, the present study aims to prospectively evaluate the occurrence, pattern and characteristics of ADRs and drug–drug interactions among general surgical inpatients, assess their clinical significance, and identify drug- and patient-related factors that may contribute to preventable medication-related harm.

MATERIALS AND METHODS

This prospective observational study was conducted by the Department of Pharmacology in collaboration with the Department of General Surgery at a tertiary care teaching hospital. The study was carried out among patients admitted to the general surgical wards during the study period. The study focused on identifying and evaluating adverse drug reactions (ADRs) and potential drug–drug interactions (DDIs) occurring during hospitalization. A total of 75 eligible patients admitted under the Department of General Surgery were included in the study after obtaining informed consent. The study was initiated after obtaining approval from the Institutional Ethics Committee.

Study Population and Sample Size

The study population consisted of adult patients admitted to the general surgical wards who received pharmacological treatment during their hospital stay. A total sample size of 75 patients was selected for the study based on feasibility and the number of eligible patients available during the study period. Patients were followed prospectively from the time of enrolment until discharge to identify suspected ADRs and clinically relevant drug–drug interactions.

Inclusion Criteria

- Patients aged 18 years and above admitted to the general surgical wards.
- Patients receiving two or more medications during hospitalization.
- Patients admitted for surgical management and remaining in the hospital for sufficient duration to permit medication monitoring.
- Patients of either sex who were willing to participate in the study.
- Patients or their legally acceptable representatives who provided written informed consent.

Exclusion Criteria

- Patients below 18 years of age.
- Patients admitted only for minor procedures or day-care surgery with very short hospital stay.
- Patients who were transferred to another department before adequate medication monitoring could be performed.
- Patients with incomplete medical or medication records.
- Patients who were unwilling to participate or whose consent could not be obtained.
- Patients with suspected ADRs clearly attributable to intentional or accidental drug overdose, poisoning or substance abuse.

Study Tool

The following tools and sources were used for systematic collection and evaluation of drug-safety information:

- A predesigned and structured case record form for recording demographic, clinical and medication-related information.
- Patient case sheets, treatment charts, medication records and relevant laboratory investigation reports.
- The WHO-Uppsala Monitoring Centre causality assessment system and/or Naranjo algorithm for assessment of the causal relationship between a suspected drug and ADR.
- Hartwig and Siegel Severity Assessment Scale for categorizing ADRs according to severity.
- Schumock and Thornton criteria for assessing the preventability of ADRs, wherever applicable.
- Standard drug-interaction references/databases were used to identify and categorize potential drug–drug interactions according to their clinical significance.

Data Collection

- Demographic details including age, sex and relevant clinical characteristics were recorded for each patient.
- Primary surgical diagnosis, associated comorbidities, type of surgical procedure and duration of hospital stay were documented.
- Complete medication details, including drug name, dose, route, frequency and duration of therapy, were recorded.
- Patients were monitored throughout hospitalization for the development of suspected ADRs.
- Details of each suspected ADR, including the suspected drug, time of onset, clinical presentation, management and outcome, were documented.
- Causality, severity and preventability of identified ADRs were assessed using standard pharmacovigilance assessment tools.
- All prescribed medications were reviewed for possible drug–drug interactions.
- Identified DDIs were categorized according to their severity or clinical significance, such as minor, moderate or major interactions.
- Appropriate laboratory parameters and clinical findings were reviewed whenever required to support the assessment of ADRs or DDIs.
- Patients were followed until discharge, recovery from the ADR or completion of the observation period.

Outcome Measures

The primary outcome measures were the frequency and pattern of adverse drug reactions and potential drug–drug interactions among general surgical inpatients. Additional outcomes included the commonly implicated drug classes, nature and severity of ADRs, causality relationship, preventability, severity of DDIs and the relationship of ADRs/DDIs with factors such as age, comorbidities and number of medications prescribed.

Statistical Analysis

The collected data were entered into Microsoft Excel and analyzed using SPSS version 23.0 statistical software. Categorical variables were expressed as frequency and percentage, while continuous variables such as age, number of drugs and duration of hospital stay were presented as mean ± standard deviation or median with interquartile range, as appropriate. Associations between categorical variables were assessed using the Chi-square test or Fisher's exact test wherever applicable. A p-value of <0.05 was considered statistically significant.

RESULTS

Table 1. Demographic and Clinical Characteristics of General Surgical Inpatients (n = 75)

Parameter	Category/Value	n (%)
Age (years)	Mean ± SD	45.4 ± 14.0
	18–30 years	13 (17.3)
	31–45 years	26 (34.7)
	46–60 years	24 (32.0)
	>60 years	12 (16.0)
Sex	Male	49 (65.3)
	Female	26 (34.7)
Type of admission/surgery	Elective	53 (70.7)
	Emergency	22 (29.3)
Comorbidity burden	No comorbidity	46 (61.3)
	One comorbidity	21 (28.0)
	≥2 comorbidities	8 (10.7)
Major surgical diagnosis	Inguinal/ventral hernia	19 (25.3)
	Acute appendicitis	14 (18.7)
	Gallstone disease/cholecystitis	13 (17.3)
	Soft-tissue/perianal conditions	10 (13.3)
	Intestinal obstruction	8 (10.7)
	Diabetic foot/chronic wound	6 (8.0)
	Other surgical conditions	5 (6.7)
Hospital stay (days)	Mean ± SD	6.81 ± 1.96
Number of drugs/patient	Mean ± SD	6.07 ± 1.71
Polypharmacy	≥5 drugs	60 (80.0)

The mean age of the study population was 45.4 ± 14.0 years, with the majority of patients falling between 31 and 60 years of age. Males constituted nearly two-thirds of the study population. Elective surgical admissions were more common than emergency admissions, accounting for 70.7% of patients. Approximately 38.7% of patients had at least one associated comorbidity. Hernia, appendicitis and gallstone-related conditions constituted the major surgical diagnoses. The mean medication burden was 6.07 drugs per patient, and 80.0% of patients fulfilled the operational definition of polypharmacy.

Table 2. Pattern of Drug Utilization Among General Surgical Inpatients

Drug class	Patients exposed, n (%)	Medication orders, n (%)
Antimicrobials	68 (90.7)	110 (24.2)
Analgesics/NSAIDs	66 (88.0)	79 (17.4)
Proton-pump inhibitors	61 (81.3)	64 (14.1)
Antiemetics	54 (72.0)	57 (12.5)
Anticoagulants/antiplatelets	36 (48.0)	40 (8.8)
Antihypertensive drugs	25 (33.3)	31 (6.8)
Antidiabetic drugs	18 (24.0)	23 (5.1)
Opioid analgesics	17 (22.7)	19 (4.2)
Other supportive medications	14 (18.7)	32 (7.0)
Total medication orders	—	**455 (100)**

A total of 455 medication orders were recorded among the 75 patients, corresponding to a mean medication burden of approximately six drugs per patient. Antimicrobial agents were the most commonly utilized drug group, with 90.7% of patients receiving at least one antimicrobial. Analgesics and NSAIDs were prescribed to 88.0% of patients, reflecting their routine perioperative use. Proton-pump inhibitors and antiemetics were also frequently prescribed. Nearly half of the patients received anticoagulant or antiplatelet therapy. The high exposure to multiple pharmacological classes provides an appropriate clinical setting for evaluating ADRs and potential drug–drug interactions.

Table 3. Pattern of Adverse Drug Reactions Observed Among General Surgical Inpatients

Suspected drug	ADR observed	Number of ADRs	% of total ADRs	Management/Outcome
Ceftriaxone	Maculopapular rash	2	16.7	Drug withdrawn/antihistamine; recovered
Metronidazole	Nausea/vomiting	2	16.7	Symptomatic management; recovered
Diclofenac	Epigastric pain/gastritis	2	16.7	Drug stopped/PPI therapy; recovered
Tramadol	Nausea/dizziness	2	16.7	Dose modification/symptomatic treatment
Piperacillin–tazobactam	Diarrhoea	1	8.3	Supportive management; recovered
Enoxaparin	Injection-site ecchymosis	1	8.3	Observation/monitoring
Insulin	Hypoglycaemia	1	8.3	Dose adjustment/glucose administration
Ondansetron	Headache	1	8.3	Symptomatic management
Total		**12**	**100**	

Ten of the 75 patients developed at least one suspected ADR, giving a patient-level ADR occurrence of 13.3%. A total of 12 individual ADR episodes were identified because two patients experienced more than one reaction. Antimicrobial agents, analgesics and centrally acting analgesics accounted for most suspected reactions. Gastrointestinal manifestations such as nausea, vomiting and epigastric discomfort were among the common clinical presentations. Most ADRs improved following symptomatic treatment, withdrawal or dose modification of the suspected drug. No fatal ADR was observed, suggesting that the majority of reactions were manageable with early recognition and appropriate intervention.

Table 4. Causality, Severity and Preventability Assessment of Adverse Drug Reactions (n = 12 ADRs)

Assessment	Category	n	%
WHO-UMC causality	Certain	0	0
	Probable/Likely	7	58.3
	Possible	5	41.7
	Unlikely	0	0
Hartwig and Siegel severity	Mild	7	58.3
	Moderate	5	41.7
	Severe	0	0
Schumock and Thornton preventability	Definitely preventable	2	16.7
	Probably preventable	6	50.0
	Not preventable	4	33.3

According to the WHO-UMC causality assessment, 58.3% of the suspected reactions were classified as probable/likely and the remaining 41.7% as possible. No ADR was categorized as certain because rechallenge or other definitive causal evidence was not available. Severity assessment showed that 58.3% of ADRs were mild and 41.7% were moderate, with no severe reaction observed in the present study.

Preventability assessment indicated that 16.7% were definitely preventable and another 50.0% were probably preventable. Thus, approximately two-thirds of the observed ADRs had some potential for prevention. These findings emphasize the role of active pharmacovigilance and prospective medication review in surgical wards.

Table 5. Pattern and Severity of Potential Drug–Drug Interactions Among General Surgical Inpatients

A. Common Potential Drug–Drug Interaction Pairs

Drug combination	Major potential clinical concern	n	% of DDIs
Metronidazole + ondansetron	Additive QT-related risk	18	18.2
Diclofenac + enoxaparin	Increased bleeding risk	14	14.1
Tramadol + pregabalin	Additive CNS/respiratory depression	13	13.1
Ciprofloxacin + ondansetron	QT prolongation risk	10	10.1
Aspirin + enoxaparin	Increased bleeding risk	8	8.1
ACE inhibitor/ARB + NSAID	Renal impairment/reduced antihypertensive effect	7	7.1
Fluoroquinolone + insulin	Altered glucose control/dysglycaemia	5	5.1
Other combinations	Various	24	24.2
Total		**99**	**100**

B. Severity Distribution of Potential DDIs

Severity category	n	%
Major	8	8.1
Moderate	71	71.7
Minor	20	20.2
Total	**99**	**100**

Potential DDIs were identified in 48 of the 75 patients, corresponding to a prevalence of 64.0%. Ninety-nine individual interaction episodes were detected, giving an average of approximately 2.06 potential DDIs among patients with at least one interaction. Moderate interactions constituted the largest category, accounting for 71.7%, whereas major interactions represented 8.1%.

Interaction pairs involving antimicrobials, antiemetics, NSAIDs and anticoagulants were prominent. Bleeding, QT-related effects, renal dysfunction and enhanced CNS depression were among the principal theoretical clinical concerns. These findings suggest that systematic medication review may be particularly useful in surgical patients receiving multiple perioperative medications.

Table 6. Association of Selected Patient- and Treatment-Related Factors With ADRs and Potential DDIs

Risk factor	ADR in factor-present group	ADR in factor-absent group	p-value	DDI in factor-present group	DDI in factor-absent group	p-value
Age >60 years	4/12 (33.3%)	6/63 (9.5%)	**0.048***	9/12 (75.0%)	39/63 (61.9%)	0.519†
Female sex	3/26 (11.5%)	7/49 (14.3%)	1.000†	16/26 (61.5%)	32/49 (65.3%)	0.746*
≥2 comorbidities	3/8 (37.5%)	7/67 (10.4%)	0.068†	7/8 (87.5%)	41/67 (61.2%)	0.245†
Polypharmacy ≥5 drugs	10/60 (16.7%)	0/15 (0%)	0.196†	42/60 (70.0%)	6/15 (40.0%)	**0.030***
Hospital stay >7 days	6/34 (17.6%)	4/41 (9.8%)	0.497†	25/34 (73.5%)	23/41 (56.1%)	0.117*
Emergency surgery	7/22 (31.8%)	3/53 (5.7%)	**0.005†**	18/22 (81.8%)	30/53 (56.6%)	**0.038***

* Chi-square test.; † Fisher's exact test; A p-value <0.05 was considered statistically significant.

ADR occurrence was significantly higher among patients aged above 60 years compared with younger patients (33.3% vs. 9.5%, p=0.048). Emergency surgical patients also demonstrated a significantly greater frequency of ADRs than elective patients (31.8% vs. 5.7%, p=0.005). The presence of two or more comorbidities showed a higher numerical ADR rate, although the association did not reach statistical significance. Potential DDIs were significantly more frequent among patients receiving five or more medications (70.0% vs. 40.0%, p=0.030). Emergency surgery was also associated with a higher prevalence of potential DDIs (81.8% vs. 56.6%, p=0.038). Sex and duration of hospitalization did not demonstrate statistically significant categorical associations in this present study.

Table 7. Spearman Correlation of Medication Burden and Clinical Variables With ADRs and Drug–Drug Interactions

Variables correlated	Spearman's ρ	p-value
Number of drugs vs. number of DDIs	**0.477**	**<0.001**
Number of drugs vs. number of ADRs	**0.313**	**0.006**
Age vs. number of DDIs	0.103	0.379
Age vs. number of ADRs	**0.364**	**0.001**
Number of comorbidities vs. number of DDIs	**0.311**	**0.007**
Duration of hospital stay vs. number of ADRs	0.184	0.115
Duration of hospital stay vs. number of DDIs	**0.301**	**0.009**

The strongest observed relationship was between the number of medications prescribed and the number of potential DDIs, which demonstrated a moderate positive correlation (ρ=0.477, p<0.001). Medication burden also showed a weaker but statistically significant positive correlation with the number of ADRs (ρ=0.313, p=0.006). Increasing age was positively associated with ADR occurrence but not significantly associated with the number of DDIs. The number of comorbidities showed a significant positive correlation with DDI burden (ρ=0.311, p=0.007). Duration of hospital stay demonstrated a weak positive association with the number of DDIs but not with ADR frequency. Overall, the correlation analysis suggests that increasing medication exposure is the most important pharmacological factor associated with drug-related problems in this surgical population.

DISCUSSION

The present prospective observational study evaluated adverse drug reactions (ADRs) and potential drug–drug interactions (DDIs) among 75 patients admitted to the general surgical wards of a tertiary care teaching hospital. The mean age of the study population was 45.4 ± 14.0 years, with a predominance of males (65.3%). Polypharmacy, defined as the use of five or more medications, was observed in 80.0% of patients, with a mean of 6.07 drugs prescribed per patient. This high medication burden is expected in surgical practice because patients frequently receive combinations of antimicrobials, analgesics, antiemetics, proton-pump inhibitors, anticoagulants and drugs for associated comorbid conditions. In the present study, antimicrobials were the most frequently prescribed drug class, followed by analgesics/NSAIDs, proton-pump inhibitors and antiemetics. This pattern reflects the multidrug exposure occurring during perioperative care and highlights the need for active pharmacological surveillance. Potential DDIs were detected in 64.0% of patients, with 99 individual interactions identified. This finding is comparable to the high frequency of interactions reported among hospitalized populations. Rashid et al. evaluated hospitalized medical patients and identified at least one potential DDI in 77% of patients, with a mean of approximately seven medications prescribed per patient. Importantly, they demonstrated a significant relationship between polypharmacy and the occurrence of DDIs (r=0.628, p<0.001) [11]. Similarly, Zerah et al., in an analysis involving 1,950 older hospitalized patients, reported potentially clinically significant DDIs in 54% at baseline and 58% at hospital discharge, with hyperpolypharmacy emerging as an important predictor of increased

interaction burden [12]. These observations are consistent with the present finding that patients receiving five or more medications had significantly more DDIs than those receiving fewer than five drugs (70.0% versus 40.0%, p=0.030).

The predominance of moderate interactions in the present study is also comparable with findings from other hospital settings. Of the 99 potential interactions identified, 71.7% were moderate, 20.2% were minor and 8.1% were major. Ghimire et al. reported potential DDIs in 89.11% of intensive-care patients and identified 490 interactions, of which 63.46% were of moderate severity [13]. Their higher overall prevalence can reasonably be attributed to the critical nature of ICU patients and a greater medication burden, with an average of 8.08 drugs per prescription. In the present study, the number of medications showed the strongest correlation with the number of DDIs (Spearman's $\rho=0.477$, $p<0.001$), further supporting medication burden as an important determinant of interaction risk. Stipp et al. also demonstrated that active observation identified substantially more perioperative medication-related incidents than spontaneous self-reporting, emphasizing the value of systematic surveillance in surgical patients [14]. The pattern of interacting medicines observed in the present study also has clinical relevance. Frequently identified combinations involved antimicrobials, antiemetics, NSAIDs, anticoagulants and centrally acting analgesics, with potential consequences including QT prolongation, bleeding, renal dysfunction and enhanced central nervous system depression. Surgical patients represent a particularly vulnerable group because several of these medications may be introduced simultaneously during the perioperative period. Xie et al. emphasized that drug-related problems are common among surgical patients, particularly in those with polypharmacy and underlying diseases, and proposed medication therapy management and surgical pharmacy services as important components of enhanced recovery and perioperative safety programs [15]. These observations reinforce the importance of collaboration between pharmacologists, pharmacists, surgeons and other members of the surgical care team.

ADRs were documented in 10 of the 75 patients in the present study, giving an occurrence rate of 13.3%, with 12 individual ADR episodes. Antimicrobials and analgesic drugs were prominent among the suspected agents, while gastrointestinal symptoms, cutaneous reactions, dizziness and minor bleeding manifestations were commonly encountered. Seo et al., in a large prospective study involving 5,000 hospitalized patients, reported ADRs in 10.2% of patients, a frequency reasonably close to that observed in the present study. Opioids represented the largest proportion of overall ADRs in their study, whereas antibiotics were the most important drugs associated with significant ADRs. They also observed that patients with ADRs remained hospitalized approximately five days longer than those without ADRs [16]. The slightly higher ADR frequency in the present study may relate to active prospective surveillance and the concentrated exposure to antimicrobials, analgesics and other perioperative medications among surgical patients. Causality assessment showed that 58.3% of ADRs were probable/likely and 41.7% were possible according to WHO-UMC criteria. Most reactions were mild (58.3%) or moderate (41.7%), and no severe or fatal reaction was observed. Of particular importance, 66.7% of the reactions were considered either definitely or probably preventable. The relatively high proportion of potentially preventable reactions suggests that medication review, dose adjustment, recognition of previous drug intolerance and closer laboratory or clinical monitoring may reduce drug-related harm. Schmidt et al., during clinical-pharmaceutical medication reconciliation among 356 elective hospital patients, found that 7.3% reported ADRs and also demonstrated substantial deficiencies in available medication information, with clinical information-system data being incomplete or outdated in 76.7% of patients [17]. Their findings support systematic medication reconciliation as a practical strategy for identifying medication-related problems early during hospitalization.

Older age and emergency admission appeared particularly important in the present analysis. Patients aged above 60 years had a significantly greater occurrence of ADRs than younger patients (33.3% versus 9.5%, p=0.048), while emergency surgical patients had significantly higher ADR rates (31.8% versus 5.7%, p=0.005) and DDI prevalence (81.8% versus 56.6%, p=0.038). Age also showed a significant positive correlation with ADR burden ($\rho=0.364$, p=0.001). These relationships are clinically plausible because elderly and emergency patients frequently have multiple comorbidities, altered pharmacokinetics, organ dysfunction and greater exposure to rapidly initiated multidrug regimens. Sagua et al. analysed 670 medication-safety incidents in surgical patients and found that 50% involved opioids, antimicrobials or antithrombotic drugs, while 73.9% did not ultimately cause patient harm [18]. The prominence of the same broad medication groups in the present study supports targeted monitoring of these high-use and potentially high-risk drug classes within general surgical wards. Overall, the findings demonstrate that ADRs and potential DDIs constitute relevant medication-safety concerns in general surgical inpatients. The significant association of DDIs with polypharmacy, together with the relationship of ADRs with older age and emergency admission, helps identify patients who may benefit most from intensified medication surveillance. Prospective monitoring by the Department of Pharmacology in collaboration with the surgical team could therefore contribute to earlier recognition of ADRs, appropriate assessment of clinically meaningful DDIs and prevention of avoidable medication-related harm.

CONCLUSION

The present study demonstrates that ADRs and potential drug–drug interactions are common and clinically relevant among general surgical inpatients, particularly in patients exposed to polypharmacy. ADRs occurred in 13.3% of patients, while

64.0% had at least one potential DDI, with moderate interactions forming the majority. Increasing medication burden was significantly associated with DDI occurrence, while older age and emergency surgical admission were important factors associated with ADRs. A considerable proportion of ADRs were potentially preventable. These findings emphasize the value of prospective pharmacovigilance, systematic medication review and close collaboration between the Departments of Pharmacology and General Surgery to identify high-risk prescriptions, improve rational drug use and enhance medication safety in surgical patients.

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