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A CROSS-SECTIONAL DATA-DRIVEN ANALYSIS OF DRUG UTILIZATION AND SAFETY OPTIMIZATION IN THE MEDICAL INTENSIVE CARE UNIT OF A TERTIARY CARE HOSPITAL AT COIMBATORE

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ABSTRACT

Background: Critically ill patients frequently require multiple medicines, parenteral therapy and rapid treatment adjustments, increasing the complexity of medication-use and safety decisions. Drug-utilization assessment can identify prescribing patterns and potential areas for improvement. **Objective:** To describe drug-utilization patterns and selected medication-safety indicators among patients admitted to the Medical Intensive Care Unit (MICU) of a tertiary-care hospital in Coimbatore, India. **Methods:** A cross-sectional, observational study was conducted among 50 MICU patient encounters. Demographic and clinical characteristics, laboratory investigations, length of stay, medication classes, dosage forms, medication burden, selected drug–drug interactions and selected prescribing indicators were summarized descriptively. The study records report Institutional Research Committee protocol approval SRIPMSCOP/IQAC/IRC/M. Pharm./2026/MPP/02; the exact ethics committee name and consent procedure should be confirmed against the approval documents. **Results:** Patients aged 51–65 years formed the largest age group (15/50; 30%), and 38/50 (76%) were male. Neurological disorders were the most frequent major diagnostic category (16/50; 32%), followed by respiratory disorders (9/50; 18%) and cardiovascular disorders (7/50; 14%). The dataset listed 834 medication

items and 304 distinct medicines across 30 therapeutic classes. Cardiovascular medicines accounted for 13.82% of distinct medicines, followed by gastrointestinal medicines (11.51%) and antibiotics (9.87%). Injectable dosage forms accounted for 481/834 medication items (57.67%). Polypharmacy was common: 39/50 patients (78%) received at least 11 medicines. Two major potential drug–drug interactions were documented. **Conclusion:** The findings indicate a substantial medication burden and frequent use of injectable medicines in this MICU cohort. Routine medication reconciliation, interaction screening, laboratory-informed dose review and antimicrobial stewardship may support safer prescribing. Methodological details and other source-table discrepancies should be confirmed before submission.

KEYWORDS: Drug utilization; Medical intensive care unit; Polypharmacy; Drug–drug interactions; Prescribing indicators; Medication safety.

INTRODUCTION

Drug-utilization research examines the marketing, distribution, prescription and use of medicines, with particular attention to their medical, social and economic consequences. It supports evaluation of whether medicines are used rationally, safely and efficiently and can inform interventions to improve prescribing practice.[1,2]

Medication use in an intensive care unit (ICU) is complex because critically ill patients often have multiple diagnoses, rapidly changing organ function, high medication exposure and frequent transitions between routes of administration. These factors can increase the risk of dosing problems, adverse drug events and clinically important drug–drug interactions. Renal and hepatic function, microbiological results and therapeutic response are particularly relevant when reviewing medicines in critical care.[3]

WHO prescribing indicators provide a structured approach to assessing selected aspects of medicine use, including average medicines per encounter, prescribing by generic name, antibiotic use, injectable use and use of essential medicines. These indicators are useful for identifying potential improvement areas, but their interpretation must account for the clinical context; general outpatient reference values should not be treated as strict targets for a critically ill inpatient population.[4,5]

Local drug-utilization data can help identify institution-specific patterns and inform medication-safety priorities. The present study assessed prescribing and medication-use

characteristics among 50 patients admitted to the MICU of a tertiary-care hospital in Coimbatore, with emphasis on medication burden, injectable use, selected interactions and opportunities for safety optimization.

AIM AND OBJECTIVES

The aim was to assess drug-utilization patterns and selected medication-safety indicators among patients admitted to the MICU.

The objectives were to describe patient demographics and clinical characteristics; summarize medication classes, dosage forms and medication burden; document selected major potential drug–drug interactions; and compare selected prescribing indicators with published reference values, while acknowledging the limitations of applying general WHO indicators to critical-care practice.

MATERIALS AND METHODS

Study design and setting

This was a cross-sectional, observational study conducted in the Medical Intensive Care Unit of Sri Ramakrishna Hospital, a tertiary-care hospital in Coimbatore, Tamil Nadu, India. Data were recorded using a structured data-collection form and information from patient medical records, prescription charts, medication-administration records and laboratory reports.

Study period and participants

The project documents describe a study period from December 2025 to August/September 2026, with approximately six months allocated to active data collection. The exact start and end dates should match the approved protocol and source data. The analyzed sample comprised 50 eligible MICU patient encounters.

Eligibility criteria

The project records state that patients admitted to the MICU during the study period were eligible irrespective of age or gender when adequate demographic, clinical, laboratory and medication information was available and the required informed consent had been obtained. Records with substantial missing information and cases in which consent was declined were stated to be excluded. The final article should reproduce the exact approved criteria rather than planned or prospective wording.

Data collection and variables

The recorded variables included age, gender, marital status, presenting symptoms, past medical history, major diagnosis, comorbidities, laboratory investigations, length of stay, prescribed medicines, therapeutic class, dosage form, number of medicines per encounter and selected potential drug–drug interactions. The manuscript dataset reports 834 medication items and 304 distinct medicines grouped into 30 therapeutic classes.

Statistical analysis

Data were summarized descriptively using frequencies and percentages. Where the denominator was 50 patients, percentages were calculated using the number of patients divided by 50. Medication-level percentages used the reported total of 834 medication items unless otherwise specified. Because some source tables contain inconsistent denominators or counts, these values must be checked against the original patient-level dataset before the final submission. No inferential analysis is reported.

Ethics

The institutional certificate records Institutional Research Committee protocol number SRIPMSCOP/IQAC/IRC/M. Pharm./2026/MPP/02. However, the certificate also indicates that specific Human/Animal Ethics Committee clearance is required. The applicable ethics approval or formal waiver, committee name, approval date and informed-consent procedure must therefore be confirmed from the official ethics documentation before submission. This manuscript does not claim that the Institutional Research Committee certificate alone constitutes human-participant ethics approval.

RESULTS AND DISCUSSION

Participant characteristics

Fifty MICU patient encounters were included. The largest age group was 51–65 years (15/50; 30%), followed by patients aged 66–74 years and 75–84 years (10/50; 20% each). Thirty-eight patients (76%) were male and 12 (24%) were female. Forty-seven patients (94%) were recorded as married. These findings describe the enrolled cohort only and should not be interpreted as population-level risk estimates.

Characteristic	Category	n (%)

Age	13–18 years	1 (2%)
Age	19–35 years	4 (8%)
Age	36–50 years	7 (14%)
Age	51–65 years	15 (30%)
Age	66–74 years	10 (20%)
Age	75–84 years	10 (20%)
Age	85 years or older*	3 (6%)
Gender	Male	38 (76%)
Gender	Female	12 (24%)
Marital status	Married	47 (94%)
Marital status	Unmarried	3 (6%)

Note: The original age table labels one category as "<85", which is ambiguous. The category label and count should be verified against the source dataset before submission.

Presenting symptoms, diagnoses and comorbidities

Respiratory symptoms were the most frequently recorded reason-for-admission category (33 occurrences; 66%), followed by systemic/constitutional symptoms (24; 48%) and neurological/sensorium-related symptoms (22; 44%). Categories could overlap, so their percentages are not expected to sum to 100%. Neurological disorders were the most frequent major diagnostic category (16/50; 32%), followed by respiratory disorders (9/50; 18%) and cardiovascular disorders (7/50; 14%). Hypertension and diabetes mellitus were the most frequently listed comorbidities, with 11 occurrences each in the source table.

Variable	**Category**	**n (%) or count**
Reason for admission	Respiratory symptoms	33 (66%)
Reason for admission	Systemic/constitutional symptoms	24 (48%)
Reason for admission	Neurological/sensorium symptoms	22 (44%)
Reason for admission	Gastrointestinal symptoms	13 (26%)
Reason for admission	Pain	11 (22%)
Reason for admission	Trauma/external causes	7 (14%)
Reason for admission	Genitourinary symptoms	3 (6%)
Major diagnosis	Neurological disorders	16 (32%)
Major diagnosis	Respiratory disorders	9 (18%)
Major diagnosis	Cardiovascular disorders	7 (14%)
Major diagnosis	Renal disorders	5 (10%)
Major diagnosis	Gastrointestinal/hepatic disorders	3 (6%)
Major diagnosis	Endocrine/metabolic disorders	2 (4%)
Major diagnosis	Oncological disorders	2 (4%)
Comorbidity	Hypertension	11 occurrences
Comorbidity	Diabetes mellitus	11 occurrences

The source lists comorbidity counts as occurrences rather than mutually exclusive patient categories; therefore, they should not be presented as percentages of all 50 patients unless the

denominator and overlap are confirmed.

Laboratory monitoring and length of stay

Blood counts, differential leukocyte counts and electrolyte testing were recorded for 49/50 patients (98%) each. Liver function tests were recorded for 48/50 (96%), renal function tests for 46/50 (92%) and urine examination for 38/50 (76%). Length of stay was most commonly 2–4 days (22/50; 44%), followed by 5–7 days (16/50; 32%). These frequencies indicate that laboratory monitoring was commonly documented, but do not establish whether results were reviewed in time or whether dose adjustments were appropriate.

Measure	n (%)
Blood count	49 (98%)
Differential leukocyte count	49 (98%)
Electrolytes	49 (98%)
Liver function tests	48 (96%)
Renal function tests	46 (92%)
Urine examination	38 (76%)
Length of stay: 1 day	4 (8%)
Length of stay: 2–4 days	22 (44%)
Length of stay: 5–7 days	16 (32%)
Length of stay: 8–10 days	4 (8%)
Length of stay: 11–13 days	2 (4%)
Length of stay: 17–19 days	2 (4%)

Medication classes and dosage forms

The dataset reported 304 distinct medicines across 30 therapeutic classes. Cardiovascular medicines were the largest class (42/304; 13.82%), followed by gastrointestinal medicines (35/304; 11.51%), antibiotics (30/304; 9.87%) and vitamins/minerals/nutritional supplements (29/304; 9.54%). Injectable dosage forms were the largest category in the dosage-form table (481/834; 57.67%), followed by tablets (184/834; 22.06%), nebulization (38/834; 4.56%) and intravenous fluids/infusions (37/834; 4.44%).

Therapeutic class	Distinct medicines (n)	Percentage
Cardiovascular drugs	42	13.82%
Gastrointestinal drugs	35	11.51%
Antibiotics	30	9.87%
Vitamins/minerals/nutritional supplements	29	9.54%
CNS/neurological drugs	20	6.58%
Respiratory drugs	17	5.59%
Sedatives/anesthetics/muscle relaxants	13	4.28%

Dosage form	Medication items (n)	Percentage
Injectables	481	57.67%

Tablets	184	22.06%
Nebulization	38	4.56%
IV fluids/infusions	37	4.44%
Syrups	36	4.32%
Capsules	26	3.12%
Topical preparations	12	1.44%

Injectable use is expected in critical care when rapid onset, reliable delivery or titration is required. Nevertheless, each injectable prescription should be reviewed for indication, dose, compatibility, administration rate, line access and ongoing need. Conversion to oral or enteral treatment should be considered when clinically appropriate. The high medication burden also supports routine medication reconciliation and daily review of continued indications.

Polypharmacy and drug–drug interactions

The source reported 39/50 patients (78%) receiving 11 or more medicines. The medication-count distribution included 12 patients (24%) receiving 11–15 medicines, 11 (22%) receiving 16–20, 13 (26%) receiving 21–25 and 3 (6%) receiving 26–30. Two major potential drug–drug interactions were documented: clarithromycin with fluconazole, associated with additive QT-prolongation risk, and carbamazepine with deflazacort, for which enzyme induction may reduce exposure to the active metabolite of deflazacort. These should be reported as potential interactions unless clinical manifestations or causality were assessed.

Potential interacting medicines	Severity recorded	Potential concern
Clarithromycin + fluconazole	Major	Additive QT-prolongation risk; assess ECG, electrolytes and clinical context.
Carbamazepine + deflazacort	Major	Enzyme induction may reduce exposure to the active metabolite of deflazacort.

The interaction findings support medication review using a reliable interaction resource, assessment of patient-specific risk factors and documentation of the action taken. The study did not report whether either interaction caused a clinical adverse event; therefore, the manuscript should not infer harm or treatment failure.

Selected prescribing indicators

The source indicator table reported generic-name prescribing at 17.87% (149/834), antimicrobial prescribing in 46/50 encounters (92%), injectable use in 50/50 encounters (100%) and essential-medicines-list (EML) representation at 42.81% (357/834). The confirmed dosage-form count was 481 injectable items out of 834 medication items

(57.67%). The encounter-level indicator (50/50 encounters with at least one injectable) is a separate measure and should not be confused with the proportion of medication items that were injectable.

Indicator	Value reported in source	Interpretation/caution
Generic-name items	149/834 (17.87%)	Confirm how generic versus brand items were classified.
Antimicrobial use	46/50 encounters (92%); 144/834 items (17.27%)	Encounter prevalence and share of medication items are different measures.
Injectable use	481/834 (57.67%) medication items; encounter-level injectable use reported separately as 50/50 (100%)	Corrected to 481/834 (57.67%); encounter-level measure is separate.
EML-listed items	357/834 (42.81%)	Confirm the edition/list used and classification method.

WHO prescribing indicators were developed primarily for standardized assessment of medicine use and are not necessarily direct performance targets for a high-acuity MICU. In particular, a high proportion of antibiotics or injections may reflect illness severity, but should trigger indication-based review rather than be labeled automatically inappropriate. The manuscript should describe these as contextual comparisons, not as proof of irrational prescribing.[4,5]

Safety optimization implications

The findings suggest several practical priorities: (1) daily medication reconciliation and review of continued indications; (2) renal- and hepatic-function-informed dose assessment; (3) structured interaction screening for high-risk combinations, including QT-prolonging medicines; (4) antimicrobial review with culture-guided de-escalation where appropriate; (5) assessment of IV-to-oral conversion when the patient's condition permits; and (6) documentation of medication-review recommendations and their acceptance. These are recommendations arising from the observed utilization pattern, not interventions tested by this study.

LIMITATIONS

A total of 50 eligible MICU patient encounters were included as specified in the project protocol. The available project text contains inconsistent parameters in the sample-size calculation; therefore, a formula-based sample-size estimate is not reported here. The approved protocol and calculation should be checked before submission.

CONCLUSION

In this cross-sectional assessment of 50 MICU patient encounters at a tertiary-care hospital in Coimbatore, neurological disorders were the most frequent diagnostic category, cardiovascular medicines were the largest therapeutic class by distinct medicine count, and polypharmacy was common. Injectable medicines represented the largest dosage-form category, accounting for 481/834 medication items (57.67%). Two major potential drug–drug interactions were documented. Routine medication review, laboratory-informed dose assessment, interaction screening, antimicrobial stewardship and reassessment of parenteral therapy may support medication safety. Final conclusions should be confirmed after validation of the remaining source-data details.

FUNDING

This study received no specific external funding.

ETHICS AND CONSENT STATEMENT

Protocol approval number recorded in the project file: SRIPMSCOP/IQAC/IRC/M. Pharm./2026/MPP/02. The committee name, approval scope and informed-consent details must be checked against the original approval letter before submission.

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