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Drug-Utilization Pattern and Rational Prescribing Assessed by WHO / INRUD Core Prescribing Indicators in the Outpatient Department of a Tertiary Care Teaching Hospital: A Two-Cycle Cross-Sectional Audit

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Running title: *WHO core prescribing indicators in a teaching-hospital OPD*

Abstract: ***Background and objectives: Rational use of medicines is important for safe, cost-effective care, yet inappropriate prescribing remains common in outpatient practice. This study assessed drug-utilization patterns using the WHO/INRUD core prescribing indicators in the outpatient department (OPD) of a tertiary care teaching hospital over two audit cycles. Methods: A descriptive, cross-sectional prescription audit was carried out in two consecutive academic years, with 600 prescriptions in Cycle 1 and 354 in Cycle 2, collected from different departments during working hours. A structured checklist recorded the five WHO/INRUD core prescribing indicators, selected complementary indicators and documentation parameters. Data were analysed using descriptive statistics. Results: The mean number of drugs per encounter was 3.69 in Cycle 1 and 3.40 in Cycle 2, against the WHO reference of 1.6–1.8. Generic prescribing was high (97.2% and 96.6%). Antibiotics were prescribed in 24.2% and 39.8% of encounters and injections in 1.0% and 0%. Prescribing from the essential-medicines list/formulary was 66.7% and 100%. Vitamins, tonics or enzymes featured in 50.8% and 54.3% of encounters. Dose, duration and signature were documented in over 98% of prescriptions, but allergy status was never recorded, and diagnosis (26.7%) and follow-up advice (9.0%) were poorly documented. Conclusion: Strengths included high generic prescribing and low injection use, while polypharmacy and frequent vitamin, tonic and enzyme use remained common. Antibiotic and essential-medicine prescribing varied between cycles, and documentation of diagnosis, allergy status and follow-up advice needs improvement.***

Keywords: prescription audit; WHO core prescribing indicators; rational use of medicines; generic prescribing; polypharmacy

1. Introduction

Rational use of medicines means that patients receive medicines appropriate to their clinical needs, in the right dose and for an adequate period, while keeping the cost to the patient and the community as low as possible. Irrational prescribing remains a common problem. The WHO estimates that more than half of medicines are prescribed, dispensed or sold inappropriately, contributing to adverse drug reactions, antimicrobial resistance, poor adherence and unnecessary expenditure.[1]

The WHO, together with the International Network for the Rational Use of Drugs (INRUD), introduced core drug-use indicators in 1993 to provide a simple and standard way of assessing prescribing.[2] The five core indicators are the average number of drugs per encounter, prescribing by generic name, encounters with an antibiotic, encounters with an injection, and prescribing from an essential-medicines list (EML) or formulary. Reference values for these indicators can be used to compare prescribing at a health facility with expected levels.[3,4]

Prescription audit using these indicators is relatively simple and can help identify areas that need improvement. Many Indian studies have reported these indicators,[5–7] but most are based on a single audit. This makes it difficult to know whether the findings are consistent over time. Repeating the audit in the same setting can give a better picture of what is persistent and what may simply be variation between years.

The present study therefore assessed drug-utilization patterns using the WHO/INRUD core prescribing indicators, along with selected complementary and documentation indicators, in the OPD of a tertiary care teaching hospital over two consecutive audit cycles. The aim was also to identify areas where prescribing could be improved.

2. Materials and Methods

2.1 Study design and setting

This was a descriptive, cross-sectional prescription audit conducted in the OPD of a tertiary care teaching hospital in Tamil Nadu, India. The hospital provides outpatient services in several clinical specialties. The audit was carried out over two consecutive academic years, during September 2024 and September 2025, over a period of 15 days each year. Cycle 1 included 600 prescriptions and Cycle 2 included 354, giving a total of 954 prescriptions. No educational, administrative or other intervention was undertaken between the two cycles; the

two cycles therefore represent independent cross-sectional assessments in consecutive years.

2.2 Sampling and data collection

In each cycle, OPD prescriptions were collected by trained observers using random sampling, after the required permissions were obtained. Prescriptions were drawn from several departments, including General Medicine, General Surgery, Orthopaedics, Dermatology, Otorhinolaryngology (ENT), Paediatrics and Obstetrics & Gynaecology, as well as other departments, and were collected across the working hours rather than from a single time period. Each prescription was assessed once using a pre-structured checklist covering patient and prescriber details, prescription completeness and drug-use parameters. The WHO recommendation of at least 600 encounters for a core-indicator study was met in Cycle 1.

2.3 Audit indicators and operational definitions

The five WHO/INRUD core prescribing indicators were calculated as follows:

- **Average number of drugs per encounter:** total number of drugs prescribed ÷ number of prescriptions assessed (WHO reference 1.6–1.8).
- **Prescribing by generic name:** proportion of prescriptions in which medicines were written by generic (non-proprietary) name (WHO reference 100%).
- **Encounters with an antibiotic:** proportion of prescriptions containing at least one antibiotic (WHO reference 20.0–26.8%).
- **Encounters with an injection:** proportion of prescriptions containing at least one injectable (WHO reference 13.4–24.1%).
- **Prescribing from the EML/formulary:** proportion of prescriptions in which medicines conformed to the essential-medicines list/hospital formulary (WHO reference 100%).

The following additional parameters were also recorded: encounters with a vitamin, tonic or enzyme; antibiotic prescriptions conforming to the hospital antibiotic policy; encounters in which an investigation was advised; and availability of prescribed medicines in the dispensary. In Cycle 1 (n=600), prescription documentation was also assessed for patient and prescriber details, history, examination findings, allergy status, diagnosis, prescribing instructions, follow-up advice and prescriber authentication. Since only prescription-level data were available, generic prescribing and essential-medicine prescribing were recorded at the prescription level rather than at the individual-drug level (see Limitations).

2.4 Statistical analysis

Data were entered into a spreadsheet and analysed using descriptive statistics. Categorical variables are presented as frequencies and percentages. The average number of drugs per encounter is presented as a mean. Results are shown separately for the two cycles and, where appropriate, for the combined sample. No formal hypothesis testing was performed.

2.5 Ethical Considerations

The audit used routinely generated, de-identified OPD prescriptions. No intervention was involved and no identifiable patient information was collected. Institutional Ethics Committee approval, with a waiver of individual informed consent, was obtained for analysis and reporting of this records-based dataset (IEC reference number ME II/2026/46, dated 31 July 2026). Confidentiality of the records was maintained throughout.

3. Results

3.1 General Characteristics

A total of 954 OPD prescriptions were audited, with 600 from Cycle 1 and 354 from Cycle 2. Department-wise data were available for Cycle 2. Most prescriptions came from General Medicine (26.3%), Orthopaedics (18.9%), General Surgery (18.6%) and Dermatology (14.1%). The remaining prescriptions were from ENT (5.4%), Paediatrics (5.4%), Obstetrics & Gynaecology (4.8%), Urology (0.6%) and Thoracic surgery (0.6%).

3.2 WHO/INRUD core prescribing indicators

The core prescribing indicators for both cycles are shown in Table 1. The average number of drugs per encounter was 3.69 in Cycle 1 and 3.40 in Cycle 2 (pooled mean 3.58), which was above the WHO reference range of 1.6–1.8 in both cycles. Generic prescribing was high in both cycles (97.2% and 96.6%; pooled 97.0%). Antibiotic use increased from 24.2% in Cycle 1, which was within the WHO reference range, to 39.8% in Cycle 2. Injection use was low (1.0% and 0%). Prescribing from the EML/formulary was 66.7% in Cycle 1 and 100% in Cycle 2.

Table 1: WHO/INRUD core prescribing indicators across the two audit cycles compared with WHO reference values

Core prescribing indicator	WHO reference	Cycle 1 (n=600)	Cycle 2 (n=354)	Overall (N=954)
Average no. of drugs per encounter	1.6–1.8	3.69	3.4	3.58
Drugs by generic name (%)[a]	100	97.2	96.6	97
Encounters with an antibiotic (%)	20.0–26.8	24.2	39.8	30
Encounters with an injection (%)	13.4–24.1	1	0	0.6
Prescriptions from EML/formulary (%)[a]	100	66.7	100	79

EML, essential-medicines list; WHO, World Health Organization. Reference values from WHO/INRUD sources.[2,3] [a]Operationalized at prescription level in this audit (see Limitations).

3.3 Complementary drug-use indicators

The complementary indicators are shown in Table 2. Vitamins, tonics or enzymes were prescribed in 50.8% of encounters in Cycle 1 and 54.3% in Cycle 2. Among antibiotic-containing prescriptions, 69.7% in Cycle 1 and 74.4% in Cycle 2 followed the hospital antibiotic policy. Investigations were advised in 4.0% and 15.8% of encounters.

Prescribed medicines were available in the dispensary in 99.7% and 100% of encounters.

Table 2: Complementary drug-use indicators across the two audit cycles.

Complementary indicator	Cycle 1 (n=600)	Cycle 2 (n=354)
Encounters with a vitamin, tonic or enzyme (%)	50.8	54.3
Antibiotic prescriptions conforming to hospital antibiotic policy (%)[a]	69.7	74.4
Encounters with an investigation advised (%)	4	15.8
Prescribed medicines available in dispensary (%)	99.7	100

[a]*Expressed as a proportion of antibiotic-containing prescriptions.*

3.4 Prescription documentation quality

Documentation-quality parameters were assessed in Cycle 1 (n=600) and are shown in Table 3. OPD registration number, patient name, gender, age and date of consultation were recorded in 97.8%, 94.8%, 94.3%, 93.3% and 90.7% of prescriptions, respectively. Dose/schedule (99.0%), treatment duration (98.7%) and a legible signature (98.8%) were recorded in almost all prescriptions. In contrast, history was recorded in 21.5%, examination findings in 13.3% and diagnosis in 26.7%. Allergy status was not recorded in any prescription. A review date was present in 10.5% and follow-up advice in 9.0%. Handwriting was legible or written in capitals in 82.3%.

Table 3: Prescription documentation-quality parameters (Cycle 1, n=600).

Documentation parameter	Prescriptions, n	Percentage (%)
OPD registration number recorded	587	97.8
Complete patient name written	569	94.8
Gender recorded	566	94.3
Age recorded	560	93.3
Date of consultation recorded	544	90.7
Handwriting legible / in capitals	494	82.3
Brief history written	129	21.5
Salient examination findings recorded	80	13.3
Presumptive/definitive diagnosis written	160	26.7
Allergy status mentioned	0	0
Medicine dose/schedule clearly written	594	99
Duration of treatment written	592	98.7
Review (next-visit) date written	63	10.5
Follow-up advice/precautions recorded	54	9
Prescription duly signed (legibly)	593	98.8

Percentages are of the 600 Cycle 1 prescriptions. Referral details, applicable only to referred cases, were documented in 1 prescription.

4. Discussion

The audit showed a similar pattern across the two cycles, with some areas doing well and others needing attention. The clearest problem was the number of medicines prescribed. The mean was 3.69 drugs per encounter in Cycle 1 and 3.40 in Cycle 2, both well above the WHO reference of 1.6–1.8. Similar or higher values have been reported from Indian tertiary care OPDs, including 3.03 in Haryana,[5] 3.32 in Karnataka,[8] 3.5 in Kerala,[9] and 4.0 in a Puducherry health-training centre.[10] Polypharmacy may be related to older patients, multiple conditions and the use of several medicines in specialist teaching-hospital settings. It can increase the risk of interactions, adverse reactions, prescribing errors and poor adherence, and may also increase cost.[11]

Generic prescribing was one of the stronger findings. It was 97.2% in Cycle 1 and 96.6% in Cycle 2, close to the WHO ideal of 100%. This is higher than many reports from India, where generic prescribing has ranged from very low levels to about 85%.[12,13] The finding is encouraging, although it needs to be interpreted with some caution because the present audit recorded generic prescribing at the prescription level, whereas the WHO indicator is defined at the individual-drug level. This could have resulted in an overestimate.

Antibiotic use showed a different pattern. It was 24.2% in Cycle 1, within the WHO reference range, but increased to 39.8% in Cycle 2. Indian studies have reported wide variation in antibiotic use, ranging from single-digit percentages to more than 50%.[6,14,15] In the present audit, about one in four antibiotic-containing prescriptions did not follow the hospital antibiotic policy in either cycle. This makes antibiotic prescribing an important area for further review and stewardship efforts.

Injection use was very low, at 1.0% in Cycle 1 and 0% in Cycle 2, and was well within the WHO reference range. The EML/formulary finding was less consistent, with 66.7% conformity in Cycle 1 and 100% in Cycle 2. The large difference should be interpreted carefully. It may have been related to how the indicator was applied, including the reference list or formulary used or the way prescriptions were counted. Indian studies also show wide variation in EML adherence.[16,17]

Vitamins, tonics or enzymes were prescribed in about half of the encounters in both cycles (50.8% and 54.3%). Some of these prescriptions may have been clinically appropriate. However, their frequent use may contribute to polypharmacy and unnecessary cost.

The documentation findings were also important. Dose, duration and signature were recorded in almost all prescriptions, but the clinical information was often missing. Diagnosis was documented in only 26.7% of prescriptions, while history and examination findings were recorded even less often. Allergy status was not recorded at all. Review dates and follow-up advice were also uncommon. These findings point to a need for a more structured prescription format and better attention to clinical documentation.

Overall, polypharmacy, high generic prescribing and low injection use were seen in both cycles. Antibiotic use and EML/formulary conformity were less consistent. The findings suggest some practical areas for improvement: regular prescription audits with feedback, easier access to

essential-medicine lists and treatment guidelines, better adherence to the hospital antibiotic policy, and a prescription format that prompts documentation of diagnosis and allergy status. Avoidable polypharmacy and unnecessary supplement prescribing also need attention. The WHO indicators describe prescribing patterns, but they do not by themselves show whether a particular medicine was appropriate for the diagnosis. They are therefore useful for identifying areas for review rather than confirming that prescribing is appropriate.

5. Limitations

This was a single-centre audit, so the findings may not be generalizable to other hospitals. The Cycle 2 sample had 354 prescriptions, below the WHO-recommended 600 encounters, so its estimates are less precise than those from Cycle 1. Generic and essential-medicine prescribing were assessed at the prescription level rather than the individual-drug level, which may have increased these values. Documentation was assessed in detail only in Cycle 1, so these findings could not be compared between cycles. Different observers collected the data in the two cycles, which may have introduced inter-observer variation and could partly explain the differences in EML and antibiotic-policy findings. Finally, the audit did not assess whether individual drugs were appropriate for the diagnosis or why potentially irrational prescribing occurred.

6. Conclusion

Over the two audit cycles, the OPD showed good generic prescribing and very low injection use. At the same time, polypharmacy and frequent use of vitamins, tonics and enzymes were common. Antibiotic use and EML/formulary conformity varied between cycles, and important gaps were seen in clinical documentation. Regular audit and feedback, better adherence to essential-medicine and antibiotic policies, improved documentation and attention to avoidable polypharmacy may help improve prescribing in the hospital.

Declarations

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