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Prescription audit and assessment of drug use pattern using World Health Organization prescribing indicators in a tertiary care teaching and referral hospital in Himachal Pradesh, India

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Abstract
Background: *The quality of a prescription reveals the attitude of the prescriber towards rational prescribing. Rational use of drugs is an essential element in achieving high quality patient care. This study aims to audit the outpatient first encounter prescriptions using the WHO core prescribing indicators for rational use of drugs.*
Materials and Methods: *2469 prescriptions were audited over a period of three months in a tertiary care teaching hospital. Prescriptions were assessed with criteria for completeness, legibility and WHO core prescribing indicators values.*
Results and Conclusion: *Prescribing errors were common. Poor legibility and polypharmacy were common. Generic drug names were rarely used. Antibiotic use was more than optimal. However, more than 80% of medications were prescribed from essential drug list. Percentage of injections was well within the optimal limit. Our recommendations for reducing prescribing errors are regular education and training of prescribers, ongoing monitoring, awareness and communication. Other safeguards against prescription errors are electronic prescribing, prescription review by clinical pharmacists and use of standard treatment guidelines by the prescribers. Teaching hospitals have a special responsibility to society to promote rational prescribing by their staff and, through them, the future generations of physicians.*
Keywords: *WHO core prescribing indicators, rational drug use, tertiary care teaching hospital.*

Introduction

Writing a prescription is an important mode of therapeutic intervention by the doctor for the patient.[1] The quality of a prescription reflects the competence of a physician and his attitude towards rational prescribing.[2] Prescription audit is

part of the clinical audit which is defined as a quality improvement process that seeks to improve patient care and outcomes through systematic review of care against a reference standard.[3] Prescription audit can aid in improving the prescription quality and thus enable the patient to receive high standard and best quality care. Prescription audit is also an educational activity for the physicians and provides an opportunity for improvement of their prescribing practices.[4]

Prescription audit involves examining how we write prescriptions and comparing with internationally accepted criteria given by the World Health Organization (WHO) as a guide for good prescription writing.[5] Each prescription is scored according to these criteria. Therefore, the audit process involves an appraisal of the physicians' prescribing behaviours and practices.[6] This appraisal helps us identify the specific changes needed to improve our prescriptions for better patient centred management.[7]This is a study concerning an objective analysis of physicians' prescription writing skills. Our study aims to document the process of prescription audit and generates an objective report of the same. To our knowledge, no such study has been conducted in this part of the country.

Materials and Methods

The present study was a prospective cross sectional survey. The study was aimed at outpatient first encounter prescriptions. Two thousand four hundred and sixty nine (2469) prescriptions were randomly sampled from May 1, 2018 to July 31, 2108. The prescriptions were collected and analyzed on all working days. The patient encounters included all age groups and a mix of acute and chronic health problems.

Each prescription was analyzed using the spreadsheet with World Health Organization core drug prescribing indicators.[5]Each prescription was assessed for the following pieces of information:

- Name of prescriber
- Address of prescriber
- Date
- Generic name of drug
- Strength of drug
- Dose
- Frequency of administration
- Duration of treatment
- Other written instructions
- Amount of drug to dispense
- Name of patient
- Address of patient
- Age of patient

Each item was scored 0 or 1, depending on whether the relevant piece of information was missing (0) or present (1).

- Legibility

Legibility was scored on scale of 0 to 2 (2 – easily legible, 1 – just legible or legible with difficulty, 0 – illegible).

- Number of drug items on prescription
- Number of antibiotics on prescription
- Number of injections on prescription
- Number of drugs prescribed from essential drug list

All data were processed using Microsoft Excel 2007. In the statistical analysis, ranges, averages/ means and percentages were obtained.

The core prescribing indicators that were assessed:

- The average number of drugs prescribed per encounter to measure the degree of poly pharmacy. It was calculated by dividing the total number of different drug products prescribed by the number of encounters surveyed. Combinations of drugs prescribed for one health problem were counted as one.
- Percentage of drugs prescribed by generic name was calculated to measure the tendency to prescribe by generic name. It was calculated by dividing the number of drugs prescribed by generic name by total number of drugs prescribed, multiplied by 100.
- Percentage of encounters in which an antibiotic was prescribed was calculated to measure the overall use of this commonly overused and costly form of drug therapy. It was calculated by dividing the number of

patient encounters in which an antibiotic was prescribed by the total number of encounters surveyed, multiplied by 100. Antibiotics were classified based on the WHO model list for antibiotic classification.[5]

- Percentage of encounters with an injection prescribed was calculated to measure the overall level of use of this commonly overused and costly form of drug therapy. It was calculated by dividing the number of patient encounters in which an injection was prescribed by the total number of encounters surveyed, multiplied by 100. Vaccinations were not counted as injections.
- Percentage of drugs prescribed from essential drug list (EDL) was calculated to measure the degree to which the prescribing patterns conform to the national drug policy.[8] Percentage was calculated by dividing the number of products prescribed which are in national list of essential medicines by the total number of drugs prescribed, multiplied by 100.

Results

The number and the percentage of prescriptions which met the WHO criteria of prescription writing are depicted in Table 1 and Figure 1 respectively. The date and the patient details such as name, age, gender and address were printed on the prescriptions at the time of registration. The prescriber details such as department and hospital address were also printed at the time of patient registration. Therefore, these details were present on 100% of prescriptions. The name of the prescribing doctor was not printed at the time of registration. Out of 2469 prescriptions audited, 842 (34%) did not have the physician's initials making it difficult to identify the prescribing physician. The strength of the drug prescribed (and hence the dose) was not mentioned in 14% of prescriptions. The duration of treatment was missing in as many as 21% of prescriptions. Other instructions such as medication to be swallowed before or after meals, time and route of administration were clearly written in only 13 (0.5%) prescriptions. The results of the assessment of prescriptions for legibility are shown in Figure 2. 1703 (69%) of the prescriptions analyzed were just legible or legible with difficulty; and 222 (9%) were illegible. A total of 9879 drugs were prescribed in 2469 patient encounters. The average number of drugs per prescription was 4 and ranged from 2 to 8 drugs. Only 3.8% of the drugs were prescribed by generic names. 81% of drugs were prescribed from the essential drug list (EDL). 980 antibiotics and 187 injections were prescribed over 2469 patient encounters. Table 2 depicts the WHO core prescribing indicator values observed in this study versus the optimal values proposed by WHO.

Table 1-Number of encounters which met the criteria of prescription writing out of 2469 prescriptions assessed

Serial number	Criteria	Number of prescriptions
1	Name of prescriber	1629
2	Address of prescriber	2469
3	Date	2469
4	Strength of drug	2123
5	Dose	2123
6	Frequency of administration	2469
7	Duration of treatment	1950
8	Other written instructions	13
9	Amount of drug to dispense	0
10	Name of patient	2469
11	Address of patient	2469
12	Age of patient	2469

Figure 1-Percentage of prescriptions which met the criteria of prescription writing

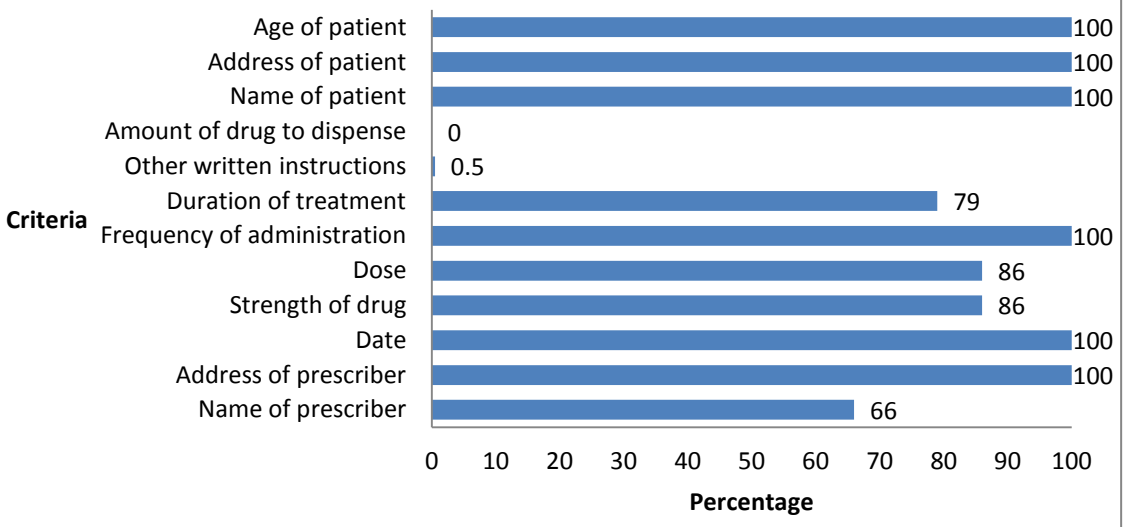

Figure 2-Percentage of prescriptions and the levels of legibility

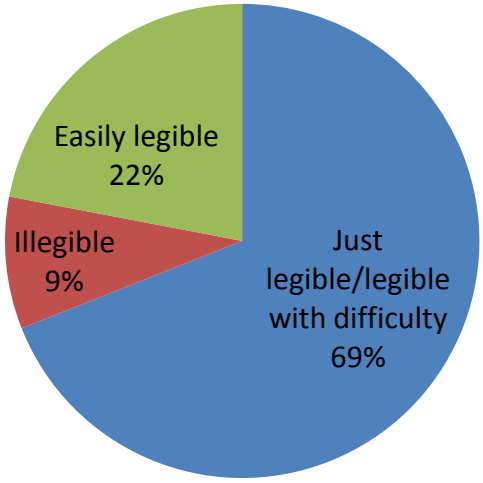

Table 2-WHO core prescribing indicator values in our study: summary of results of prescription audit (n= 2469)

WHO core indicator	Number of drugs	Mean %	Optimal value (%)
Generic drug name	94	3.8	100
Antibiotics	980	39.7	≤30
Injections	187	7.6	≤10
Prescribed from EDL*	2000	81	100

*Essential Drug List

Discussion

The most important requirement for prescription writing is that the prescription should be clear. It should be legible and indicate precisely what should be given.[6] There is legal obligation to write clearly. Based on the findings of our study, some prescription practices may be considered for improvement. In our study we found that the

patient details such as name, age, gender, address and the date of visit were printed at the time of registration and were present on all the prescriptions assessed. However, the prescriber's initials were missing in 34% of patient encounters making it difficult to identify the treating physician. Ahsan et al in their study reported that 17% of prescriptions did not have the initials of the prescribing physician.[9]This can make the prescription null and void. Some medications cannot be dispensed without a valid prescription. The strength and/or dose of the formulation were missing in 14% of patient encounters in our study. This causes dosing errors and makes the drug treatment either ineffective or toxic. Dosing errors were the most common error type in a study from North West England (20.6%).[10] Dosing errors such as overdose are one of the most serious types of error reported. It has been suggested that electronic prescribing can eliminate these errors via alerts, cautions and required fields at the patient entry/prescribing stage.[10] Duration of treatment was not specified on 21% of prescriptions in our study. This figure is 13% in the study by Ahsan et al.[9] This type of error can be serious if ongoing treatment can cause serious harm such as the use of anticoagulants. It can also result in premature discontinuation of treatment. In our study, there was lack of clear written directions for the administration of the medications such as before or after meals, time of administration and route in 99.5% of patient encounters. In another study from India, there were no written instructions to patients regarding the use of medication in 65% of prescriptions.[9] This could be because of heavy work load of physicians; and they tend to rely on verbal instructions rather than written instructions. However, this has a potential for significant harm to the patient because of the poor recall of verbal instructions by the patient. Illegible prescriptions and non-standard abbreviations were another source of prescription error in our study. 69% of prescriptions were difficult to decipher and 9% were illegible. Similar results have been reported in another study from North India.[9] Illegible handwriting can lead to dispensing of wrong medication and serious injury to the patient. To avoid this risk, the use of capital letters when prescribing drugs has been advocated.[11]The use of electronic prescribing systems can significantly reduce the errors due to poor legibility.[10]

World Health Organization core prescribing indicators are used to assess the rational use of drugs in health care facilities for the treatment of acute and chronic illnesses. The average number of drugs per consultation in our study was 4. This is an evidence of polypharmacy. This value is much higher than the average number of drugs prescribed per encounter in other studies from India[12] (3.1) and abroad[13] (2.4). The average number of drugs per encounter is a measure of the degree of polypharmacy which is defined as concurrent use of multiple medications by a patient. Rational prescribing is advocated to avoid wastage of medicines and to avoid possible adverse effects to patients.[2] Moreover, prescribing unnecessary medications to patients has cost implications for national health systems. Polypharmacy also increases the risk of prescribing errors. The strongest predictor of error was the number of items on a prescription (risk of error increased 14% for each additional item) in a study from nine hospitals across England.[10]

The percentage of drugs prescribed by generic name was low (3.8%) in our study. This low rate of generic name prescribing has been observed in many other studies from India and abroad.[9, 12, 13] In a study with a large sample size from a teaching and referral university hospital from Ethiopia, the percentage of drugs prescribed by generic name was 98.7%.[14] The very low rate of generic name prescribing in our study may be because of physicians' bias against the efficacy of generic drugs and their background experience with different brand name drugs. WHO highly recommends prescribing medications by generic name as a safety precaution for patients because it identifies the drug clearly, enables better information exchange and allows better

communication between health care providers.[15] It is also less costly.

The percentage of encounters with an antibiotic was 39.7% which is higher than the optimal value proposed (≤ 30%). In a study from a teaching hospital in North India, the percentage of encounters with an antibiotic prescribed was 39%.[9] It was 32.2% in a study from Saudi Arabia.[13] In our study, it is difficult to judge whether antibiotics were inappropriately prescribed as it was not part of the study design. However, the prescribers need to be educated that overuse and misuse of antibiotics can lead to adverse reactions and the risk of emergence of antibiotic resistant strains of bacteria.[16]

Injections were prescribed in 7.6% of encounters, which was well within the acceptable limit proposed by WHO (≤ 10%). This is comparable to other studies from teaching hospitals in India.[9, 17] The rate of prescribing injections was much higher (>20%) in primary and secondary care settings.[12, 18] In a study from a teaching and referral hospital in Ethiopia, this figure was 38.1%.[14] Use of injections when oral formulations are more appropriate is irrational because the cost of injections is always higher than that of oral therapy. It increases the risk of blood borne infections such as hepatitis and HIV/AIDS being transmitted through the use of non sterile injections.[1]

In our study, the percentage of encounters with drugs from the essential drug list was 81%. This figure was 79.2% in the study by Ahsan et al.[9] Values higher than 90% have been reported from Saudi Arabia[13] and Ethiopia.[14] 99.8% is the figure reported from Bahrain which is close to the optimum.[19] The optimum value proposed by WHO is 100%. Prescribing drugs from the essential drug list issued by WHO provides a framework for rational prescribing; drugs on the list are well established drugs, already tested in practice, with established clinical use and lower cost than newer drugs.[8, 20]

Our study is limited in that it is not designed to reveal the reasons leading to prescription errors, polypharmacy and low percentage of drugs prescribed by generic name and from essential drug list. Future studies are required to investigate these reasons. The study has a number of strengths. It is the first study to be conducted in this part of the country with a large sample size in a tertiary care teaching and referral hospital. Use of WHO core drug prescribing indicators adds strength to the study.

Conclusion

The study is a prescription audit and assessed more than 2400 prescriptions using WHO core drug prescribing indicators. Prescribing errors were common such as dosing errors, duration of treatment not specified, lack of clear written instructions for drug administration, missing signatures and poor legibility. The results showed that the percentage of drugs prescribed by generic name was far less than the optimal value. The average number of drugs prescribed per encounter was much higher than the optimal value. It is an indicator of polypharmacy which increases the risk of prescribing errors. The percentage of encounters with an antibiotic prescribed was higher than the optimal and the percentage of drugs prescribed from the essential drug list was less than optimal. The prescribing errors can lead to adverse effects and patient harm. We suggest that the prescribers need continuing education about rational prescribing and motivation to prescribe drugs by generic name and from the essential drug list or formulary list. We recommend awareness, regular training, assessment and ongoing monitoring of prescribers and medical students for safe and rational prescribing to meet the WHO core criteria of drug prescribing. Use of electronic prescribing and involvement of or prescription review by clinical pharmacists at all points of the medication process is also recommended to safeguard patients from prescribing errors. Standard treatment guidelines have proved useful and effective in promoting rational and safe drug use.

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