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OPTIMIZING MEDICATION USE IN THE DEPARTMENT OF ORTHOPEDICS: A PRESCRIPTION AUDIT AT A MEDICAL COLLEGE TEACHING HOSPITAL IN DEHRADUN, UTTARAKHAND.

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Abstract

Background: A prescription, is a written communication from a physician to the pharmacist, instructing them to deliver specific prescription drug/s for the specific patient. Prescription audits are fundamental in upholding the hospital's high standards for patient care.

Aim: The purpose of this observational cross-sectional study was to review, screen, and analyze the prescriptions from the Department of Orthopedics at a Medical College Teaching Hospital in Dehradun, Uttarakhand, and to identify and resolve the low-scoring characteristics to augment the prescription quality of our Centre.

Methodology: The Prescriptions were analyzed in the Department of Pharmacology associated with the Teaching Hospital, Dehradun, Uttarakhand, in terms of legibility, and completeness in terms of prescribers', patients, and drug information using the WHO core prescribing indicators.

The collected data was analyzed in Microsoft Excel.

Results: The total number of prescriptions analyzed was 750, containing a total of 2588 drugs i.e. on average 3.45 drugs per prescription. More than 42% of the prescriptions lacked the duration of therapy. Allergic history was lacking in more than 75% of the prescriptions. Cholecalciferol D3 was the most commonly prescribed drug in 482 patients (64.3%) whereas, Aceclofenac was the most commonly prescribed NSAID in 128 patients (17.6%) followed by Paracetamol and Etoricoxib in about 15.7% and 15.3% respectively. About 71% of prescriptions were deemed to be of excellent legibility.

Conclusion: This study helped us understand the role of prescribing the drugs by their generic names and standard treatment guidelines. To raise the standard of patient care, we strongly advise that similar research be carried out to educate medical faculty on judicious prescribing.

Keywords: Prescription, Medication use, audit, generic medications, Orthopedics

Introduction

Prescription writing is an essential and a requisite skill for the healthcare professionals working in various clinical domains. A well-written, comprehensible and a rational prescription will address the patient's medical needs and will prevent the medication errors during drug dispensation. A prescription is a medico-legal document hence, it is imperative for a Registered Medical Practitioner to take due cognizance while delivering a prescription. Medication errors may occur by virtue of errors of commission or omission which may eventually put the prescribing physician in the spot in the form of loss of patients' goodwill and faith, civil and criminal litigations, and several disciplinary actions on the prescribing physician by the medical committees. Globally, the medication errors alone are accountable for up to 41% hospital admissions inflicting a considerable social and economic impact [1].

Several studies have expressed that incorporating collaborative student-teacher sessions can help in fine-tuning the indispensable expertise of prescription writing in the medical students i.e. the future prescribers. Several teaching methodologies including but not limited to the P-drug exercises, problem-based learning exercises, and exercises on writing prescriptions are already in place in the teaching curriculum. These exercises help in imparting the quintessential skills in the medical students to effectively formulate an inventory of medications, choose appropriate case-specific medication/s and thereby helping to escalate the patient compliance and limiting the chances of irrational and obsolete prescription practices in the future [2].

The legibility of the prescription is another significant factor that is as important as formulating a diagnosis and prescribing the appropriate medications applicable to the patient's diagnosis for an impeccable prescription. It is an essential link between various factors deliver the best possible treatment to the patient [3].

A prescription audit is a vital tool necessary for improvising the patient care and treatment outcomes through a systematic review of care. Hence, it is imperative that separate prescription audits are conducted separately for the Outpatient Departments (OPD) as well as the Inpatient Departments (IPD) on a regular basis to ensure that the WHO core drug prescribing indicators are adhered to and complied within the prescriptions which will eventually help scrutinize, evaluate, and mitigate any error at the level of prescription writing [4].

The objective of this study was to audit the drug prescriptions from the OPD of Orthopedics at the Government Doon Medical College, Dehradun, Uttarakhand, India in order to investigate and identify the recurring low scoring parameters, and to apply and take corrective actions to improve the overall quality of our prescriptions.

AIM

To conduct prescription audit from the department of Orthopedics in Medical College Teaching Hospital in Dehradun, Uttarakhand, India.

Objectives

1. To evaluate the completeness and aptness of patients' and prescriber's information.
2. To analyze the drug-related information in prescriptions.
3. To evaluate WHO core prescribing indicators for each prescription [5].

Materials and methods

The study titled "Optimizing Medication Use in the Department of Orthopedics: A Prescription Audit at a Medical College teaching Hospital in Dehradun, Uttarakhand" was carried out in the department of Pharmacology in association with the department of Orthopedics, Government Doon Medical college, Dehradun, Uttarakhand, India after receiving approval from the institutional ethics committee (18/10/2023, GDMC/IEC/2023/85).The study was conducted over a period of 6 months. Convenience sampling was used as sampling technique.

Relevant demographic data, diagnosis, completeness of the prescription, and the adverse drug reactions to the prescribed treatment if any, were collected, using a preset proforma. The collected data was evaluated for aptness and rationality using the WHO core prescription indicators. The screening, collection and analysis of the prescription data from orthopedics OPD after taking a written informed consent by the patients.

Study Design

Type of study: - Prospective Observational cross sectional study.
Sample Size: - A total of 750 handwritten prescriptions were randomly sampled and analyzed irrespective of the patient characteristics, diagnosis and treatment.
The following parameters were employed to analyze the OPD prescriptions:
1. Patients' and Prescriber's information
2. Drug related information
3. WHO Core prescribing indicators [5].
Descriptive parameters were then used to combine the results for statistical analysis.
Legibility of the recorded prescriptions were analyzed by a subjective grading scale based on two independent investigators as:

- Grade 1 (poor): Illegible
- Grade 2 (average): Most words are illegible
- Grade 3 (good): Some words are illegible but understood by a physician
- Grade 4 (excellent): Legible

Manual ingress of the appropriate data in the MS-excel spreadsheets was done on a regular basis.

Results

A total of 750 handwritten prescriptions from the OPD of the Department of Orthopedics associated with the Medical College Teaching Hospital, Dehradun, Uttarakhand, India were randomly screened, collected, and evaluated. The standard prescription template was in a print format with the name of the hospital, complete name of the patient, prescriber's details, OPD registration number and the date of consultation. Common omissions in the prescriptions included the precautionary instructions to the patients regarding the treatment, details about subsequent follow-up visits and weight of the patient (pediatric age group). Allergic history of the patient was absent in 90% of the prescriptions. The findings of our study from patient and prescriber data are listed in **Table 1.**

Prescription Analysis

The drug data findings are depicted in accordance with the WHO core prescribing indicators. In the present study the average number of medications per prescription, were 3.45. A total of 7% of the total prescriptions contained an antibiotic drug, and 2% of the prescription involved an injectable drug. About 69% of the total drugs were prescribed by their generic names and 100% of drugs were prescribed from the National List of Essential Medicines (NLEM) [6]. Findings are mentioned in **Table 2.**
Approximately 80% of the prescriptions included a multi-vitamin and a multi-mineral supplement. Overall >80% of the prescribed medications were available at the hospital dispensary. **Figure 1.**
71% of the total hand written prescriptions were ascertained to be of excellent legibility, 24% of prescriptions were ascertained to be of good legibility, 4% and 1% were ascertained to be of average and poor legibility respectively. The findings are mentioned in the **Figure 2.**
Comparison of the WHO core prescribing parameters from previous studies is mentioned in **Table 3.**
About 42% and 23% of the prescriptions, lacked the total duration and the dosage of the therapy, respectively. Findings are mentioned in **table 4.**
Among the drugs prescribed, vitamins and mineral preparations comprised 27.05%, non-steroidal anti-inflammatory drugs (NSAIDs) constituted 47.6%, of which Aceclofenac (17.6%) was the most

prescribed. NSAIDs, was followed by calcium and antacids / drugs inhibiting acid production at 29.1% and 14.2% of the prescriptions respectively. **Table 5**

The most prescribed drug combinations prescribed in our study have been summarized in **table 6.**

As per the drug-utilization indicators, drug monotherapy was prescribed in only 82 (11%) prescriptions; remaining 668 (89%) received combination therapy, 210 (28%) patients of them received two drugs at a time. Whereas, three or more drugs were prescribed in 457 (61%) patients suggesting a trend of polypharmacy. **Figure 1**

The median duration of therapy was 8.2 days. A total of 170 (22.7%) patients received treatment for less than 2 weeks; 353 (47%) patients were prescribed pharmacotherapy for 2 to 4 weeks and 227 (30.3%) patients, were prescribed drugs for more than 4 weeks.

A mention of the presumptive / definitive diagnosis was missing in 82 prescriptions. The use of unapproved short forms of drugs was widely prevalent as was observed in several prescriptions. For example, Paracetamol was abbreviated as PCM and B-complex vitamins were mentioned as BC etc. The Dose, the frequency, and the duration of therapy was absent in few prescriptions. The most commonly used prescribed combinations in our study have been summarized in **table 6.**

Table 1: Patient and Prescriber's Information

S. No.	Parameter	Percentage
1	OPD Registration number mentioned	100%
2	Complete name of patient is written	100%
3	Age in years mentioned (Months if <5 years)	89%
4	Weight in kg (only patients of pediatric age group)	16%
5	Gender of patient	90%
6	Date of consultation (day/month/year)	98%
7	Brief history written	91%
8	Salient features of clinical examination recorded	76%
9	Allergy status mentioned	10%
10	Presumptive/definitive diagnosis written	89%
11	Investigations advised	77%
12	Follow up advice and precautions are recorded	60%
13	In case of referral, the relevant clinical details and reason for referral given	60%
14	Date of next visit written	65%
15	Prescriber's name	100%
16	Prescription duly signed	100%

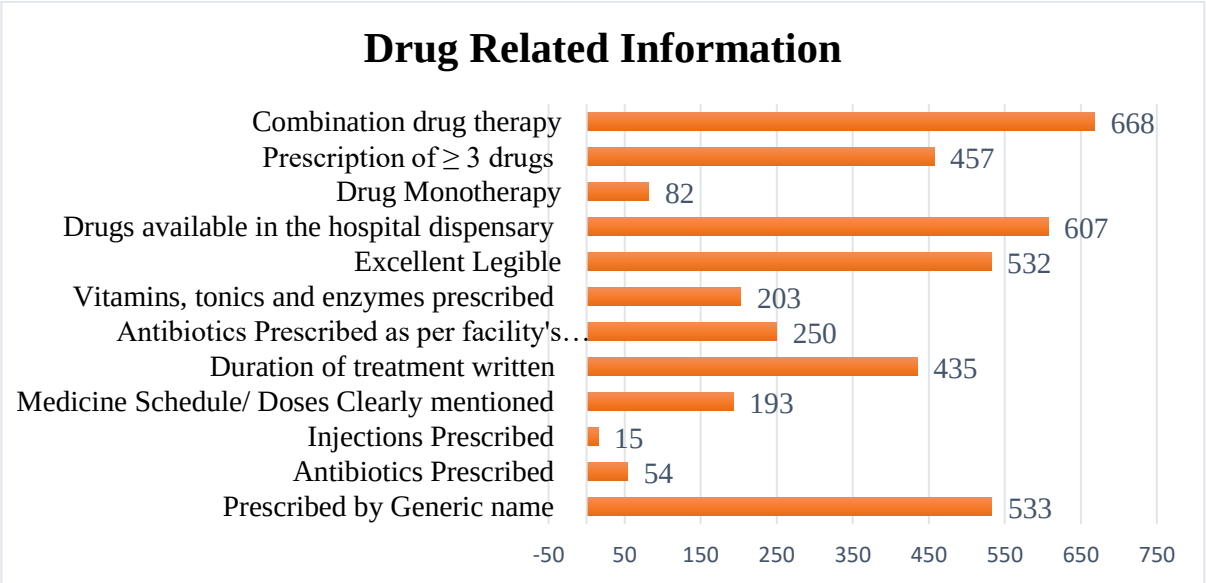

Figure 1: Drug Related Information

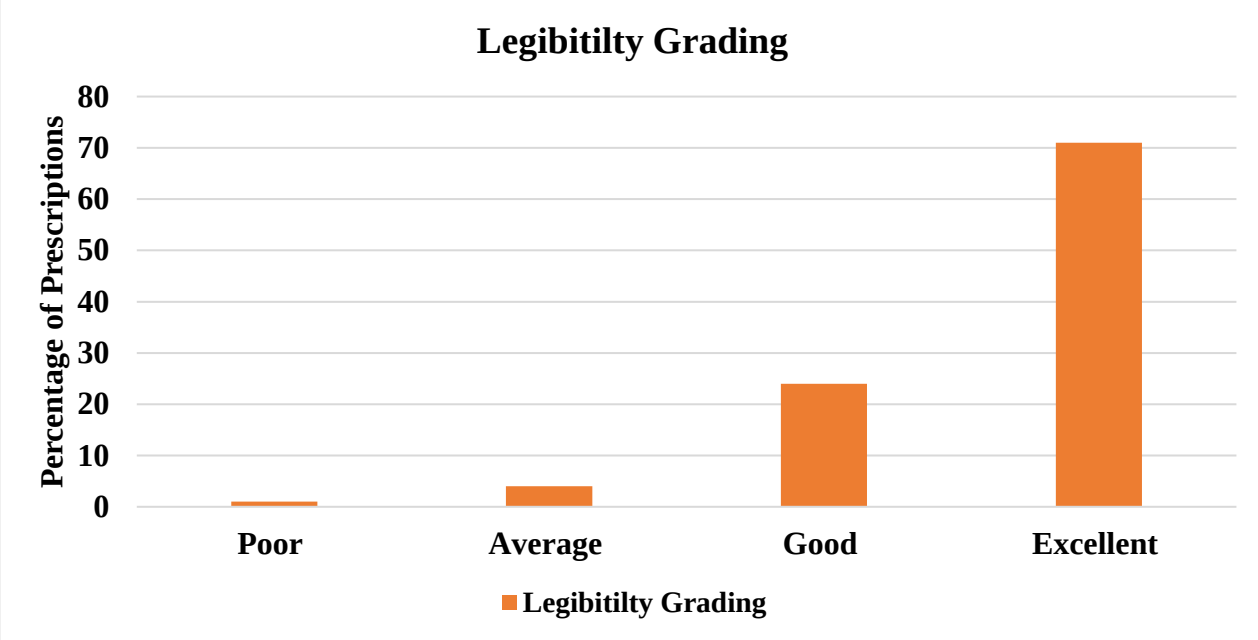

Figure 2: Legibility grading of the sampled prescriptions

Table 2: WHO Core prescribing indicators

S. No.	WHO Indicators	Findings	WHO Standard
1.	Average number of drugs per prescription	3.45	1.6-1.8
2.	Percentage of drugs are prescribed by generic name	69%	100%
3.	Percentage of encounters with an antibiotic prescribed?	7%	20 – 26.8%
4.	Percentage of encounters with an injection prescribed?	2%	13.4 – 24.1%
5.	Medicines prescribed are as per NLEM/Formulary	100%	100%

Table 3: Comparison of Core Prescribing Indicators

WHO Core Prescribing Indicators	Our Findings	Saha Et. al 2018[8]	Atal Et al 2021[9]	Prasad et. al 2022[10]
Mean no. of drugs	3.45	2.64	2.53	2.7
Prescription by generic name	69%	19.07%	15.96%	42.9%
Antibiotics	7%	15.05%	19.82%	9.6%
Injections	2%	1.19%	1.98%	1.6%
NLEM	100%	52.86%	37.37%	95.6%

Table 4: Comparison with other similar studies

S.No.	Parameters	Our Findings	Atal Et. al 2021	Rai et. al 2018	Panayappan et. al. 2017
1.	**Duration**	58%	20.93%	36.1%	87%
2.	**Schedule**	77%	11.63%	81.3%	85%
3.	**Complains / History**	53%	3.89%	56.6%	56%

Table 5: Commonly used drugs in prescription

Drug category	No. of prescriptions / 750 (%)
NSAIDs	
Paracetamol	118 (15.7%)
Aceclofenac	128 (17.6%)
Ibuprofen	55 (7.3%)
Indomethacin	80 (10.6%)
Naproxen	112 (14.9%)

Etoricoxib	115 (15.3%)
Antacids / Drugs inhibiting acid production	
Pantoprazole	115 (15.3%)
Omeprazole	182 (24.3%)
Ranitidine	46 (6.1%)
Muscle Relaxants	
Thiocolchicoside	72 (9.6%)
Chlorzoxazone	83 (11.06%)
Baclofen	68 (9.1%)
Vitamin and Mineral preparations	
Vitamin D3	482 (64.3%)
Methylcobalamin	43 (5.7%)
Pyridoxine	38 (5%)
Thiamine	13 (1.7%)
Calcium	608 (81%)
Others	
Folic acid	23 (3%)
Glucosamine+ Diacerein +Methyl Sulfonyl Methane	90 (12%)
Aceclofenac + serratiopeptidase	25 (3.3%)
Collagen	50 (6.6%)
Pregabalin	35 (4.6%)
Nortriptyline	25 (3.3%)
Prednisolone	50 (6.7%)

Table 6: Commonly prescribed as combination therapy

Combination used	No. of Prescriptions (%)	NELM Status
Acetaminophen + Tramadol	92 (12.2%)	Not Approved
Calcium + Vitamin D3	287 (38.3%)	Not Approved
Thiocolchicoside + Etodolac	63 (8.4%)	Not Approved
Aceclofenac + Paracetamol+ Serratiopeptidase	97 (12.9%)	Not Approved
Chondroitin+Diacerein+Glucosamine	78 (10.4%)	Not Approved
Pregabalin + Nortriptyline	76 (10.1%)	Not Approved
Pregabalin+methylcobalin	57 (7.6%)	Not Approved
Pantoprazole+ Domperidone	113 (15%)	Not Approved

Discussion

Prescription is an important and an essential document by the prescriber to the pharmacist for the benefit of the recipient. Prescription audit is integral at every step of the healthcare facility. Prescription audits are often conducted to streamline and evaluate the standard of care that the patients receive from the hospital. The outcomes of this study provides important insights about the prescribing drug patterns and common inclusions and omissions in prescribing behavior.

The WHO core prescribing indicators are a set of vital benchmarks for assessing the suitability of drug usage in the healthcare settings. The average number of medicines per prescription in our study was 3.45, which was relatively higher compared to the other similar studies done in the past as well as the recommendations by the WHO. According to the WHO, prescribing more than 2 drugs per patient increases the likelihood of drug interactions, chances of non-adherence to treatment due to increased pill burden and the cost of drug therapy [7]. Hence, prescribing multiple drugs combinations needs to be checked to minimize ADRs, drug interactions and patient adherence. In our study higher multi-vitamin, multi-minerals and digestive enzyme prescriptions could have led to an overall hike in the number of drugs per prescription.

In our study 100% of the drugs in all the prescriptions were prescribed from the NLEM. The use of essential medicines has shown to improve the healthcare and rational use of medicines when combined with proper procurement policies and good prescribing practices [6].

The present study observed that about 70% medications were prescribed by their non-proprietary name. Prescribing drugs by their generic name promotes rational drug prescribing and limits the cost of therapy, it also helps in limiting the prescription errors by identification of drug products by their universal scientific names and keeping a check on the use of look-alike sound alike drugs [8].

Although we're still short of our goal but, through our relentless efforts we aim to achieve the WHO-recommended objective of 100% drug prescribing by their generic names as early as possible.

Various vitamins and minerals are one of the most commonly co-prescribed medications in the orthopedic clinics [9]. In our study, Calcium topped the list among the various multi vitamins and minerals followed by Vitamin D3 supplements in a significant number of prescriptions (81% and 64.3%) which was in concordance with a study done in the past where 96% prescriptions had calcium / multivitamin formulation [10].

Widespread deficiency of calcium and vitamin D found extensively in the Indian population among all the age groups, may have prompted the use of various calcium and vitamin D3 formulations [11]. However, injudicious and rampant use of the health supplements without prior knowledge of the levels of these vitamins in the patient would be unfitting and remains a matter of grave concern.

Among the NSAIDs paracetamol was observd to be the most commonly prescribed followed by aceclofenac and ibuprofen that is in contrast with the study by Shankar *et al*. where diclofenac and meloxicam were the most commonly prescribed NSAIDs [12].

Despite the extensive utilization of the NSAIDs, their gastrointestinal side effect profile still remains a major impediment in their clinical use. Hence, these drugs are mostly co-prescribed along with antacids / agents reducing acid production [13].

In the present study also, we observed prescription of the gastro-protective agents along with NSAIDs. These findings are in communion with the study done by Nagla *et al*. where the proton pump inhibitors were the most common agents co-prescribed with analgesics [14].

In comparison to other similar studies, our study had about 7% of encounter with antibiotics, which was acceptable as per the WHO guidelines, with most of them were within the bounds of the accepted treaatment protocols.

Although, within the WHO guidelines, the proportion of injectable formulations among prescriptions in our sample was slightly higher than comparable studies.

About 71% of the prescriptions in our study had excellent legibility, 24% prescriptions had good legibility, and 4% and 1% prescriptions had average and poor legibility respectively. The number of legible prescriptions in our study was similar in comparison to other studies [15].

As a major highlight of many studies, poor handwriting of the physician irrefutably contributes to high incidence of medication errors which can have grave ramifications ranging from increase visits in the emergency department, increased durations of hospitalization to increased mortalities. One study highlighted that 1.5 million people are harmed each year in the U.S. with as much as 7000 deaths annually due to medication errors, with a significant number resulting from misinterpretation of prescriptions. A similar study, estimated illegible handwriting as a cause of up to 30,000 mortalities each year, a figure that highlights the critical nature of this issue.

In the present study 33.4% were prescribed in the form of fixed drug combinations (FDCs). FDCs are a combination of one or more active ingredients to be used for a particular indication(s). The use of FDCs has been seen to improve patient adherence due to decreased pill burden, improvement of the treatment outcomes as well reduced cost. [16].

But the most neglected aspect associated with the use of FDCs is the unanticipated side effects, extension of the adverse effect profile and the emergence of drug resistance, if prescribed inadequately.

In the recent years the trend of development of fixed drug formulations of various medications and their use is becoming increasingly popular, especially since the previous decade, which observed a

rampant rise in the number of drugs being introduced in the market as FDCs. Although the use of FDCs promise decreased pill burden and increased adherence of the patient, one of the major concerns associated with its use is the uncertain rationality of a few combinations.

The FDCs are deemed rational only if they exhibit pharmacokinetic and pharmacodynamic similarity, the quality of FDC is non-inferior, there is augmentation of the therapeutic efficacy as well as reduction in the incidence of the adverse drug effects on combining the drugs compared to the use of individual drugs [3].

One study highlighted that out of 264 FDCs available in the Indian market, only 54 were deemed to be rational FDCs. It was observed that whilst all the prescribing physicians were aware of the definition of FDCs, about 60% of them were unaware of the commonly prescribed FDCs being banned by the Government of India (GOI) on the account of being irrational/ lack of scientific justification of FDCs.

Conclusion

We were able to learn from this study how important it is to provide generic medications and adhere to the standard treatment guidelines. The Drug and Therapeutics Committee of the institute was notified of the low scoring characteristics, including the absence of duration of medication therapy, patient complains/ history, the date of the subsequent appointment, and the allergic history of the patient in the prescriptions, for improvement and implementation. In order to raise the standard of patient care, we strongly recommend that every institute should conduct similar researches and training workshops based out of these researches to educate the prescribing physicians on prudent prescribing and to alleviate the short-comings regularly, make a steady progress and to advance towards an ideal prescription.

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ETHICAL CONSIDERATIONS

Protection of humans and animals. The authors declare that no experiments involving humans or animals were conducted for this research.

Confidentiality, informed consent, and ethical approval. The authors have followed their institution's confidentiality protocols, obtained informed consent from patients, and received approval from the Ethics Committee. The SAGER guidelines were followed according to the nature of the study.

Declaration on the use of artificial intelligence. The authors declare that no generative artificial intelligence was used in the writing of this manuscript.