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## RESEARCH ARTICLE

### Prescribing Errors in Prescription Orders Containing Non-Steroidal Anti-Inflammatory Drugs: A Case Study of District Khairpur, Sindh, Pakistan.

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#### Abstract

A prescription error is a failure in the prescription writing process which results in a wrong instruction about one or more of the normal features of a prescription. The objective of this study is to identify the extent of prescribing errors in prescriptions containing Non-steroidal anti-inflammatory drugs (NSAIDs) and to find appropriate solutions for reducing these errors because NSAIDs are one of the widely misused drugs. A total of 479 prescriptions containing NSAIDs were collected from various out-patient clinical settings of district Khairpur Pakistan and analyzed retrospectively to identify the common prescribing errors, i.e. omission errors and commission errors as per prescription writing guidelines/parameters established by the World Health Organization and authenticated drug references, such as, The Drug information book and the British National Formulary (BNF). Only 21 (4.4%) prescriptions were found error free and the remaining 458 (95.6%) prescriptions contained different types of errors. Errors were divided into omission and commission errors. Among omission errors, most of the prescriptions were missing key information related to the patient, such as patient diagnosis, which was not written in 84% of prescriptions. Among information pertaining to the prescriber, the registration number was missing in 88.9% of prescriptions. Among drug related information, duration of therapy was not written in 82.8% of prescriptions. Among commission errors, 85.2% of prescriptions were ambiguously written. A significant percentage of omission and commission errors were found in routine practice. It is strongly recommended that computerized physician order entry (CPOE) and continuous educational training programs for prescribers to be implemented in order to reduce vital prescribing errors and prescriptions should be reviewed by pharmacists in order to reduce the extent of these serious and fatal errors.

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#### Introduction:-

Medication errors are among the utmost frequent incidents described in hospitals. Prescribing errors are potentially the most grave of all medication errors<sup>[1]</sup>. Prescriptions are written requests for drugs or medications prescribed by legally qualified prescribers. Drugs are mainly classified into two legal categories, i.e. prescription drugs or legend drugs and non-prescription drugs or (over the counter drug) OTC drugs<sup>[2]</sup>. Prescriptions are very vital because they become a medico-legal document once they are signed by the legal prescribing authority, and thus they are mandatory to be written completely, legibly and also free of error<sup>[3]</sup>. The legal requirements for writing a standard prescription differ from region to region. Generally a prescription includes (a) name, qualification, contact number, address, registration number and signature of the prescriber; (b) name, gender, age, weight and diagnosis of the

patient; (c) brand or generic name of drugs, dosage form, strength, frequency, dose, duration of therapy, quantity of drug to be dispensed and (d) date, directions for use and specific cautions required to be taken for use<sup>[3,4]</sup>. The prescriber is not always a doctor but can also be paramedical staff, such as a medical assistant, a technician, a midwife or a nurse. The dispenser is not always a pharmacist, but can be a pharmacy technician, a pharmacy assistant or a nurse. Every country has its own and different standards for the minimum information required to include in prescription and its own laws and regulations to define which drugs require a prescription and who is eligible to write it. Medication errors are the errors resulting in inappropriate use or harm while the medication is in the control of health care professionals and patients<sup>[5]</sup>. Medication errors may be committed by both experienced and inexperienced professionals including: pharmacists, doctors, nurses, supportive personnel (pharmacy technicians), students, clerical personnel (ward clerks), administrators, drug manufacturers, patients and their caregivers and others. The occurrence of medication errors is unknown; valid comparisons of different studies on medication errors are extremely difficult because of differences in variables, measurements, populations and methods<sup>[6]</sup>. Prescribing error is an error which occurs when, as a result of a prescribing decision or prescription writing process, there is an unintentional noteworthy a) decrease in the probability of timely and effective treatment or b) increase the probability of harm<sup>[7]</sup>. Prescribing errors can be classified into two main groups: a) omission errors, which includes those errors in which there is incomplete or missing information in the prescription as well as prescriptions which are unreadable and prescriptions that do not conform to legal requirements; b) commission errors, which includes incorrect or wrongly written information in the prescription<sup>[8-9]</sup>.

The Hand-written prescription process is ineffective, costly and resource-intensive. This method has numerous other limitations such as high proportion of human errors in operating data, and documentation errors which are inevitable<sup>[10]</sup>. A study was done in a hospital of New York State; the authors stated that about 402 common types of dosage form prescribing errors were mainly related to cardiovascular drugs. The factors related to errors of these dosage forms include: Insufficient caregivers and lack of knowledge of the patient, puzzling and inconsistent nomenclature, ignorance of the safety in medicine preparation and packaging design, product marketing and insufficient health care system processes to safeguard patients<sup>[11]</sup>. Prescription errors may lead to serious morbidities and mortalities. In another study of a teaching hospital, it was found that 23.7% of the patients were affected due to the prescribing of contraindicated drugs and adversely interacting drugs and in total 1.9% of prescriptions were potentially hazardous<sup>[12]</sup>. Ridley et al. conducted a study on prescribing errors in 24 critical care units of United Kingdom. In that study errors were found in 3,141 (15%) of the prescriptions in a total of 21,589 prescriptions; among those 3,141 errors, 916 (19.6%) were stated as potentially life threatening errors<sup>[13]</sup>. Furthermore, prescription errors may also lead to an overall increase in cost of the therapy. In February 2000, Dr. Patricia and co-workers evaluated 3,540 prescription orders during a period of one week of interventions done by pharmacy staff. They observed that 351 (9.9%) prescriptions contained prescribing errors<sup>[14]</sup>. In another study, investigators compared the risk of cardiovascular diseases occurring in users and non-users of NSAIDs, concentrating on three commonly used drugs: Diclofenac, Naproxen and Piroxicam. They observed that there is consistent increased risk of cardiovascular diseases in users of NSAIDs over non-users and all three drugs had a higher risk of cardiovascular events<sup>[15]</sup>. Another study published in September 2001 revealed that there is a 4.1 times increase in the risk of developing upper gastrointestinal problems if the NSAIDs are not used properly<sup>[16]</sup>. A similar type of study was also conducted by Joseph Thomas and his teammates; they stated that patients who were using NSAIDs developed gastrointestinal side effects twice as often (19.6%) when compared to a control group (9.5%)<sup>[17]</sup>.

NSAIDs are causing serious cardiovascular and gastrointestinal problems which can be decreased with proper and rational use. Several studies regarding prescribing errors have been reported worldwide but unfortunately, sufficient literature is not available on prescribing errors in Pakistan. The aim of this study is to identify the prescribing errors in prescriptions containing Non-steroidal anti-inflammatory drugs (NSAIDs).

### Materials and methods:-

A total of 479 prescriptions containing NSAIDs were collected in district Khairpur and analyzed retrospectively for identifying errors as per standard prescription writing guidelines/parameters provided by World Health Organization<sup>[3]</sup>, authenticated drug references i.e., Drug information book<sup>[18]</sup> and British National Formulary (BNF)<sup>[19]</sup>. All prescriptions were collected and then analyzed by registered pharmacist for two main error categories, i.e. Omission Errors and Commission Errors. Among omission errors, important information related to the patient i.e., name, weight, diagnosis etc., and information related to prescriber such as; name, qualification, signature etc., and information related to drug i.e., dose, dosage form, strength etc. was analyzed. Among commission errors, information related to incorrect dose, incorrect strength, incorrect frequency etc. were also identified. Furthermore in our study, information such as brand name, strength, dose, dosage form, frequency, direction of use, was only

limited to NSAIDs, since NSAIDs are misused widely<sup>[16]</sup>. Prescriptions for drug-drug interactions were evaluated by using the Micromedex.2.0. Drug-Reax database<sup>[20]</sup>.

### Data analysis:-

Data was recorded and analyzed by registered pharmacist in Microsoft office and SPS, and results of these prescribing errors are stated in number and percentages.

### Results:-

A total of 479 prescriptions containing NSAIDs were collected and analyzed for prescribing errors. All 479 prescriptions were evaluated for the existence of vital elements to be present in the manually written prescription orders. While writing the patient prescriptions it is important to include all parameters. Only 21 (4.4%) prescriptions were found error free and the remaining 458 (95.6%) prescriptions contained different types of errors and 458 prescriptions containing errors were further evaluated in detail. In the present study, we found that the patient diagnosis was not mentioned in 84.1% of prescriptions. Patient weight, patient age and patient sex were not written in 83.2%, 60% and 52.4% of prescriptions respectively. The name of the patient was mentioned in the majority of prescriptions 97.4%. (Table1 and Figure1)

The prescriber's information is also one of the main elements to be mentioned in standard prescriptions. Non-compliance of mentioning prescriber's information was quite high, for example the registration number, qualification, name, telephone number and address was missing in 88.9%, 87.1%, 53.9%, 41.3% and 34.3% of prescriptions respectively (Table2 and Figure2). While in 89.7% prescriptions, the signature of the prescriber was present.

Drug information is an important part of the prescription. In the present study, large numbers of deficiencies regarding drug information were found in the majority of prescriptions: duration of therapy was not mentioned in 82.8% of prescriptions and other important information such as direction of use, strength, frequency and dose was not mentioned in 78.4%, 59%, 25.5% and 24.9% prescriptions respectively (Table3 and Figure3). In most of the prescriptions, Brand names and dosage forms of drugs were mentioned in 89.7% and 86.7%, respectively.

Generally, commission errors are vital and may be life threatening to the health of the patient if overlooked. A high percentage of prescriptions, 85.2%, were illegible or ambiguous. Prescriptions mentioning, dose, dosage form, strength of drugs, duration of therapy and frequency of drug use were further evaluated for commission errors. Ambiguous or nonstandard abbreviations of drug names were mentioned in 40% prescriptions. In 14.4% of prescriptions, dose was incorrect and dosage form, strength, duration of therapy, spellings of drug names and frequency of drugs was incorrect in 19.4%, 10%, 9.6%, 12.2% and 1.9% prescriptions respectively. Drug Interactions of NSAIDs with other drugs in prescriptions were found in 20.1% prescriptions. (Table4 and Figure4).

### Discussion:-

In the present study, a total of 479 prescriptions of NSAIDs drugs were collected and assessed for the identification of errors and surprisingly it was observed that the vast majority of prescriptions contained errors (95.6%) and only (4.4%) of prescriptions contained no errors. This prevalence rate of error free prescriptions agrees with Shumaila et al<sup>[21]</sup> who reported that only 4.5% of prescriptions contained no errors. Errors were divided into two main categories: omission errors and commission errors. Among omission errors, essential information related to the patient, the prescriber and the drug that had been written or not written was analyzed and it was found that most of

the prescriptions were missing key information. In patient related information, our results regarding missing patient diagnosis, 84.1% are on par with Shumaila et al. who reported that in 86% of prescriptions, the diagnosis was absent. Our findings were a little higher than those obtained in studies by Nesar et al<sup>[22]</sup> and Ghoto et al<sup>[23]</sup>, they found that 75.9% and 69.58% of prescriptions respectively. In our study, patient weight was not mentioned in 83.2%

of prescriptions. Shumaila et al and Mugoyela V et al<sup>[9]</sup> also reported that in 83.9% and 93.8% prescriptions respectively, the weight of the patient was not mentioned. The same findings also agreed with Vaishali et al<sup>[24]</sup> and Irshaid et al<sup>[25]</sup>. While a large number of errors pertaining to age and sex were found, we found that 60% and 52.4% of prescriptions respectively were missing these important elements since some drugs are contraindicated in specific genders and some specific age groups. Our results corresponds to Nesar et al who reported that 57.2% and 61.3% prescriptions were missing the age and sex, while Vaishali et al reported 11% and 10% and Ghoto et al reported

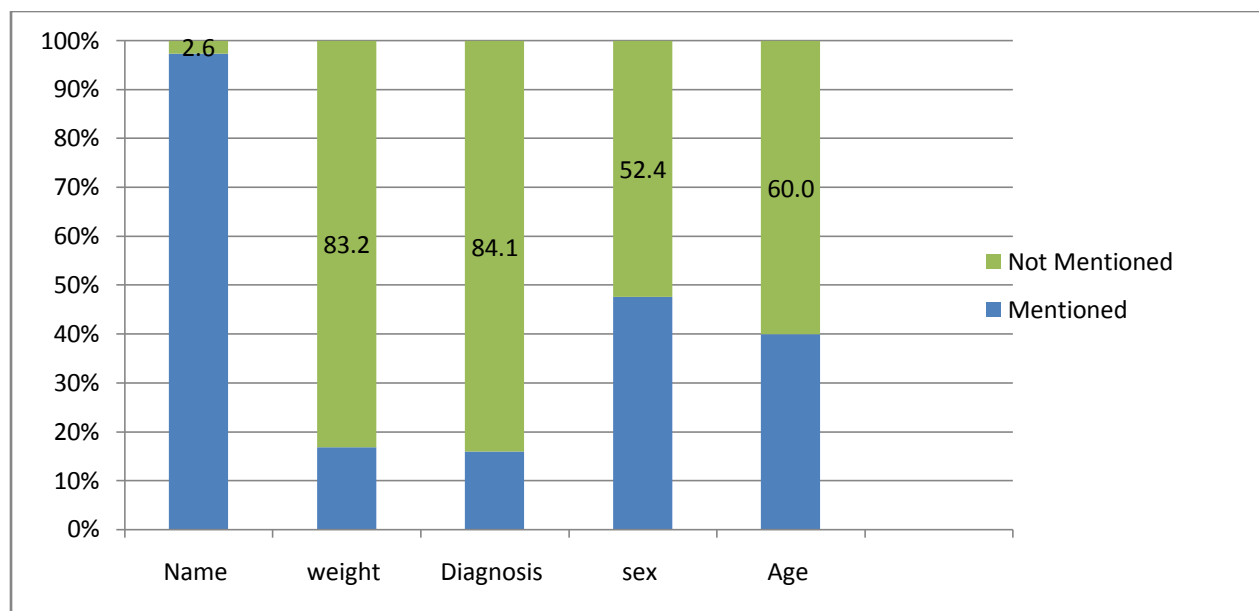
25.17% and 44.05% prescriptions respectively. The name of the patient was mentioned in 97.4% of prescriptions in our study and Nesar et al, Vaishali et al and Irshaid et al also corresponds with our findings this, they found that 96.5%, 97% and 94.6% of prescriptions respectively contained the name of patient.

Most of the prescriptions were missing the basic information of the prescriber. Our results indicate that the prevalence of missing registration number (88.9%) and qualification (87.1%) of prescribers in prescriptions are on par with Shumaila et al, who also reported that 94.5% and 93.7% of prescriptions were also missing the same information. Our results of missing information about telephone number (41.3%) and name of prescriber (53.9%) are in contrast to 76.5% and 68.7% reported by Shumaila et al., while in 10.3% of prescriptions, signature of prescribers was not mentioned, here our results concur with Shumaila et al, they reported that 11.3% of prescriptions contain no signature.

Drug information is a key component of medical prescription, it is mandatory to properly indicate this in prescriptions; otherwise life threatening adverse effects can occur. In 82.8% of prescriptions, duration of therapy or quantity of drug was not mentioned. Usage of NSAIDs for a longer duration can cause serious gastric irritation and drug induced injuries. Banks et al <sup>[26]</sup> reported that hepatotoxicity was apparent in 24% of patients by one month, in 63% of patients by 3 months and in 85% of patients by 6 months after starting using Diclofenac. Patients need proper directions for using NSAIDs, since these drugs are harmful if used on an empty stomach. These harmful consequences can be avoided by administering these drugs with food. 78.4% of prescriptions were missing the information regarding direction for use of NSAIDs and similar results (74.9%) are reported by Shumaila et al. Likewise, Vaishali reported this error is lower (45.9%) than ours. Strength of NSAIDs was missing in 59% of prescriptions, which corresponds to results reported by Shumaila et al (67.3%) and contrasts to results (3.6%) reported by Stubbs et al <sup>[27]</sup>, since many strengths of the same brand name or generic name are available in market

i.e., Brufen 200mg, 400mg, 600mg. Dose and frequency determines efficacy of drug, which was also surprisingly missing in 24.9% and 25.5% prescriptions respectively.

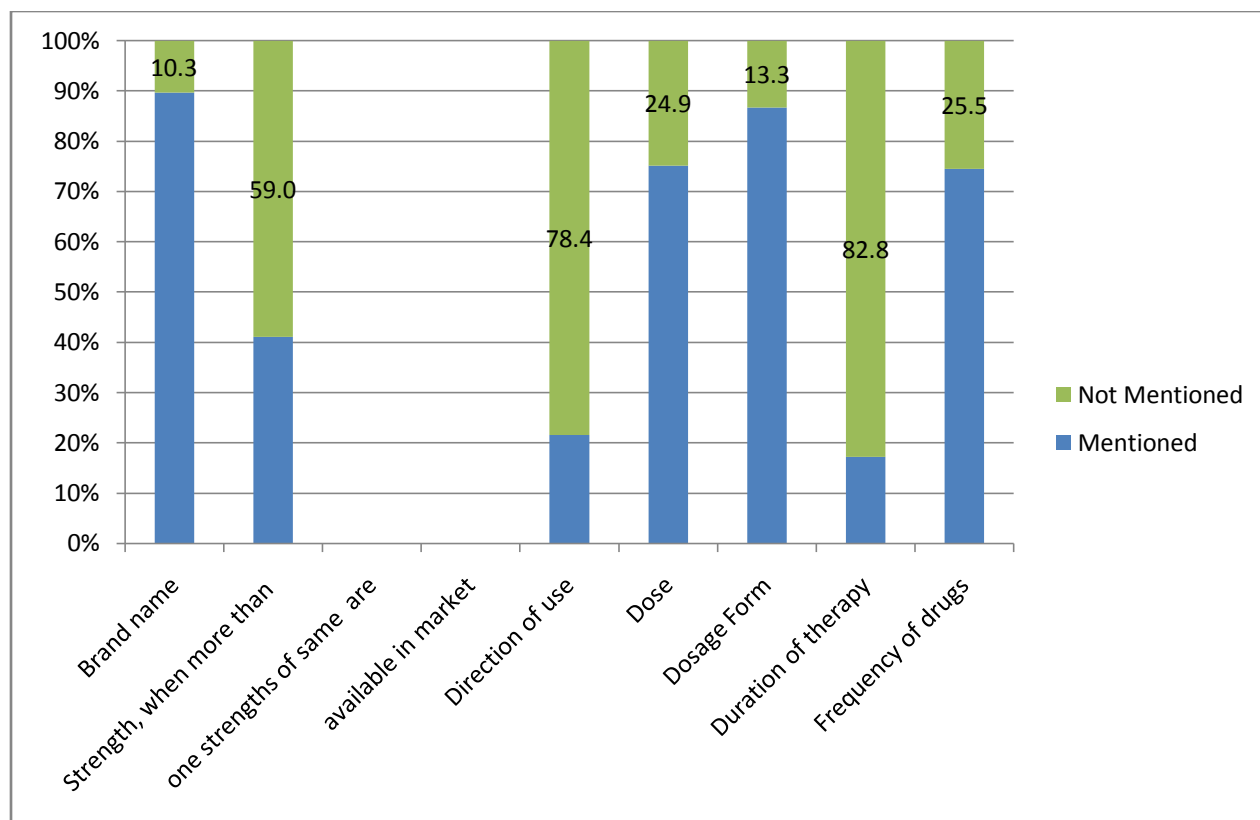
Among Commissions errors which are life threatening, it was found that 85.2% prescriptions were written ambiguously, which may result in fatal and serious problems; Shumaila et al reported this error in 77.7% of prescriptions. Ambiguous or nonstandard abbreviations of drug names were also high; we found this error in 40% of prescriptions, which can result in very serious and fatal adverse effects. Our findings are similar with Shumaila et al, they found 37.6%. Incorrect dose may lead to failure of drug treatment i.e., under dosage may not produce desired effects and over dosage may cause serious toxic effects. In our study we found that 14.4% prescriptions had incorrect doses mentioned and incorrect dosage form was also quite high in 19.4% of prescriptions. Correct frequency of drug use is also very important in maintaining therapeutic concentration of drug in plasma; the correct frequency was mentioned in majority 98.1% of prescriptions. Mentioning of incorrect, strength (10%), duration of therapy (9.6%), spellings (12.2%) and dosage form (19.4%) was also high enough and noticeable. Drug-drug interactions were found in 20.1% of prescriptions and regarding this error, the same results (19.5%) were reported by Shumaila et al. During writing prescription of drugs, the prescriber must be careful about drug-drug interactions, if they are not properly considered, these may result in not only reduced therapeutic outcomes but may also result in death of the patient.



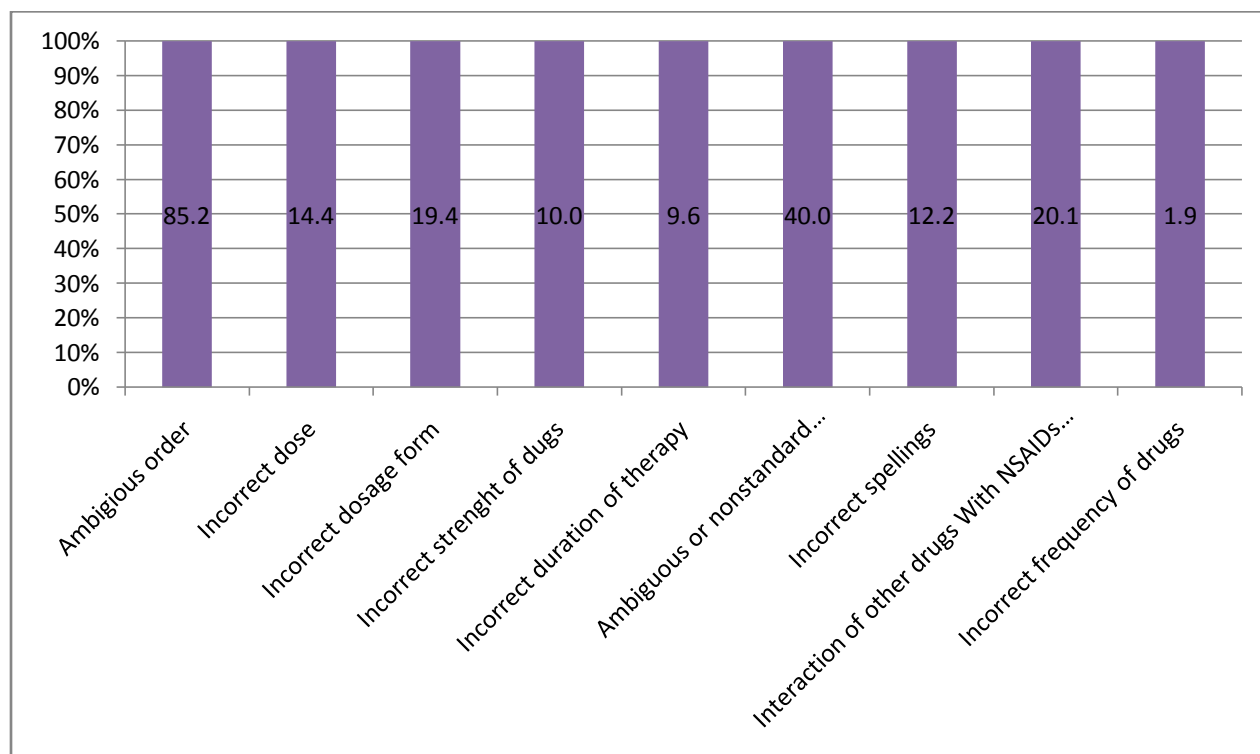
**Fig. 1:** Graphic presentation of parameters related with patient information in prescriptions



**Fig. 2:** Graphic presentation of parameters related with prescriber information in prescriptions



**Fig. 3:** Graphic presentation of parameters related with drug information in prescriptions



**Fig. 4:** Graphic presentation of commission errors in prescriptions

**Table 1:** Patient related information in prescriptions

Parameters related with Patient information	Mentioned N (%)	Not MentionedN (%)
Name	446 (97.4)	12 (2.6)
weight	77 (16.8)	381(83.2)
Diagnosis	73 (15.9)	385(84.1)
Sex	218 (47.6)	240(52.4)
Age	183 (40.0)	275(60.0)

**Table 2:** Prescriber related information in prescriptions

Parameters related with Prescriber information	Mentioned N (%)	Not MentionedN (%)
Name	211 (46.1)	247(53.9)
Address	301 (65.7)	157(34.3)
Telephone number	269 (58.7)	189(41.3)
Registration number	51 (11.1)	407(88.9)
Qualification	59 (12.9)	399(87.1)
Signature	411 (89.7)	47 (10.3)

**Table 3:** Drug related information in prescriptions

Parameters related withDrug information	MentionedN (%)	Not MentionedN (%)
Brand name	411 (89.7)	47 (10.3)
Strength, when more than one strengths of same are available in market	188 (41)	270 (59)
Direction of use	99 (21.6)	359 (78.4)
Dose	344 (75.1)	114 (24.9)
Dosage form	397 (86.7)	61 (13.3)
Duration of therapy	79 (17.2)	379 (82.8)
Frequency of drugs	341 (74.5)	117 (25.5)

**Table 4:** Information of commission errors in prescriptions

Commission error type	Number Of Prescriptions (%)
Ambiguous order	390 (85.2)
Incorrect dose	66 (14.4)
Incorrect dosage form	89 (19.4)
Incorrect strength	46 (10.0)
Incorrect duration of therapy	44 (9.6)
Ambiguous or nonstandard abbreviations of drug names	183 (40.0)
Incorrect spellings	56 (12.2)
Interaction of other drugs With NSAIDs in prescriptions	92 (20.1)
Incorrect frequency	9 (1.9)

**Conclusion:-**

It is summarized that huge number of omission errors and commission errors are occurring during the writing of prescriptions and these errors are not only seriously affecting the therapeutic outcomes of treatment but also raising the needless expenditures and utmost of the errors are linked to not mentioning essential information or mentioning inappropriate information of the patient, prescriber and drug. These errors in prescriptions can easily cause incorrect dispensing, incorrect administration of medicine, drug abuse and drug interactions. It is proposed that implementation of computerized physician order entry (CPOE) and continuous educational and training programs of prescriptions writing guidelines/standards for prescribers can meaningfully reduce the extent of prescribing errors. Most of the hospitals have computerized physician order entry systems and they found that a significant proportion of errors were eliminated. The registered pharmacists can also play an important role in minimizing and avoiding these errors by assessing the prescriptions.



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