International Journal of Advanced Research in Biological Sciences
ISSN: 2348-8069
www.ijarbs.com
Volume 3, Issue 6 - 2016

Research Article

SOI: http://s-o-i.org/1.15/ijarbs-2016-3-6-9

Evaluation of prescription errors in hospital and other clinical setups of Pakistan

Shumaila Arshad*, Hafiz Muhammad Abdullah, Manan Bhatti

Assistant Professor, Faculty of Pharmacy, The University of Lahore
1-Km Defence Road, Bhobatian Chowk,
Raiwind Road Lahore, Pakistan.
*Corresponding author: *shumailapharmacist@gmail.com*

Abstract

Patients visit physician clinic or admitted in hospital are at high risk for prescribing errors and related adverse drug events (ADEs). An effective intervention to decrease this risk, based on studies conducted mainly in Lahore by the participation of a clinical pharmacist in retail setup. As in Pakistan Healthcare System is organized differently and the role of clinical pharmacists in retail is not well established, we conducted an intervention study to investigate whether participation of a clinical pharmacist can also be an effective approach in reducing prescribing errors and related patient harm (preventable ADEs) in this specific setting. **Aims of the Project:** Evaluate the prescription errors in the retail pharmacies, prescription written by the general physicians for the patients that admitted in the public hospitals or patients that visits the private clinics.

- To checked following things in prescribing medications:

1. Omission errors
2. Dose directions
3. Legal requirements
4. Quantity
5. Duration of therapy

And compare prescribing medications with national guidelines and evidence based best practice.

- Identify possible errors in prescriptions and make appropriate recommendations.

Methods: A prospective study compared a baseline period with an intervention period. During the intervention period, aclinical pharmacist reviewed medication orders for patients that come with prescription in pharmacy, noted issues related to prescribing, formulated recommendations and discussed those during patient review meetings and with physicians (in some cases). Prescribing issues were scored as prescribing errors when consensus was reached between the clinical pharmacist and physicians. **Results:** During the 1-month study period, medication orders for 100 patients were reviewed. During the intervention period, the rate of consensus between the clinical pharmacist and physicians was 4%. The incidence of prescribing errors during the intervention period was significantly lower than during the baseline period. The following is the percentage of different types of errors. Omission Errors 41%, Dose Direction Error 11.25%, Legal Requirements Errors 55%, Quantity Mentioned Error 15%, Duration of Therapy Error 41.25%. **Conclusions:** In retail setup it is seen that participation of a clinical pharmacist was associated with significant reductions in prescribing errors and related patients harm.

Keywords: Prescription error, Clinical Pharmacist, Physicians, Pakistan Health Care System.

Introduction

Definition of medication errors

Prescription of drugs can be divided into an intellectual part—decision making, i.e. knowledge of diagnosis, interactions, and contraindications, and a technical part including communication of essential information, i.e. drug name, dose, form of administration. Our study focused on medication errors in the technical part.

A medication error was defined as an error in the medication process: ordering, transcription, dispensing, and administration, and discharge summaries. Errors included wrong as well as missing actions. Adverse drug events were defined as injuries resulting from medical interventions related to a drug—including both medication errors and ADRs. ADRs were excluded in our study. Potential adverse drug events were defined as medication errors with potential for an adverse drug event.[3]

Explanation

Since the publication of the report To Err is Human, medical errors have been of major concern worldwide. A systematic review of medical record studies on adverse events showed that the median overall incidence of in hospital adverse events was 9.2%, with a median percentage of preventability of 43.5%. Surgical-related events (39.6%) and medication-related events (15.1%) constituted the majority of adverse events. A retrospective record review study and demonstrated that the national incidence of adverse events - after weighting for the sampling frame – was 5.7%, of which 2.3% were preventable. More than 15% of all adverse events were related to medication, of which 21.2% were considered preventable.

Patients visit physician clinic or admitted in hospital are at high risk for medication errors and related patient harm (preventable adverse drug events), due to the critical nature of their illnesses, polypharmacy, use of high-risk drugs, and a high frequency of changes in pharmacotherapy. Several studies have shown that daily participation of a clinical pharmacist in the retail can effectively and efficiently reduce the number of medication errors and related patient harm. The number of medication errors was reduced threefold to fivefold but this required halftime, or even full-time (40 hours per week), commitment of a clinical pharmacist to the patient care team that visit. In The Pakistan, the staff of a hospital pharmacy consists in general of hospital pharmacists and residents; there are currently no posts for clinical pharmacists specialized in on-ward activities. Hospital pharmacists are scarce (on average, 0.75% hospital pharmacists are available per 100 hospital beds, compared with 1.42% in the United Kingdom and 14.1% in the USA) and back-office activities (such as quality assurance of sterile product compounding, therapeutic drug monitoring, medication logistics) take up most of the hospital pharmacist's time. This type of hospital pharmacy organization model limits the clinical activities to centralized off-ward services such as control of drug dosages and interactions and an on-call duty for consultations (a passive approach). Such programs would require a comprehensive and daily participation of a clinical pharmacist in retail. Within the current organization model of the hospital pharmacy in The Pakistan, such participation is not feasible because it is too time-consuming. Given the increasing awareness of medication safety problems in The Pakistan, however, a proactive onward involvement of clinical pharmacists (an active approach) seems desirable. We therefore designed an on-ward participation program for a hospital pharmacist that was tailored to our specific setting, and conducted an intervention study to explore whether this program could be of added value to medication safety in a Pakistan Retail Pharmacy Setup. Our main research question was: is the designed program associated with a reduction in prescribing errors and related patient harm?[4]

Materials and Methods

Design and setting

Expressions of interest were sought from hospitals, consultants and physicians (clinics) throughout the central Lahore.

In order to measure the prescribing errors, we had collected prescription matters from 3 – 4 neighbouring town of the Lahore.

We collected 100 prescriptions. The details of which are as follows:

Community Pharmacy (Total 60 Prescriptions)

1. Fazal Din's Pharma Plus (Total 30 Prescriptions)
2. Clinix Plus (Total 15 Prescriptions)
3. Green Plus (Total 15 Prescriptions)

Personal Record (Total 10 Prescriptions)

Hospital OPD (Total 30 Prescriptions)

1. INMOL Cancer Care Hospital (Total 15 Prescriptions)

The study was divided into two periods: a baseline period (1weeks) and an intervention period (3 weeks). In addition, the intervention period was subdivided into two halves to determine whether outcome measures were influenced by a learning process over time. Before the start of the study and during the baseline and intervention periods, the clinical services, including the ICU, offered by our central hospital pharmacy department were on-call availability of a hospital pharmacist or hospital pharmacy resident for consultations and therapeutic drug monitoring. Furthermore, a decentralized pharmacy located in and dedicated solely to the care of patients on the wards offered services consisting of preparation of ready-to-use parenteral medication by pharmacy technicians. The prepared parenteral medication orders were verified twice a day in the central hospital pharmacy department by a hospital pharmacist. All other medication orders were not routinely verified. We display various vital patient parameters, laboratory values and data from medical devices, and also present patient information such as treatment policy and drug regimen.[5]

The incorporated electronic prescribing module was not equipped with a clinical decision support system. Thepharmacists was also not accessible from the central hospital pharmacy department.

One of our group members, with more than 1 year of hospital practice experience, were assigned to the designed program to guarantee continuity and quality of the intervention (further referred to as hospital pharmacists). These pharmacists did not rotate in the clinical services schedule offered by the central hospital pharmacy department. Before the start of the study, hospital pharmacists completed a training period of 3 weeks in the hospital. During this training, they familiarized themselves with the daily practices and routines in the ward and the prevailing medication protocols and guidelines, and they learned how to retrieve all relevant information from hospital.

Other all members involved in this project are assigned to check and collect data from the retail pharmacies. In intervention periods (3 weeks) they assigned to collect few prescriptions from pharmacies and check medications error from them on daily base.[5]

Study population

All patients visited to the pharmacies between the duration of research were included in the study. If any patient was visited the pharmacy in the absence of the pharmacists in pharmacy either pharmacy of hospital or independent pharmacy then the medication orders of such patients were not taken into account for the result calculations.

No exclusion criteria were applied. This Medical Ethics Committee judged the protocol as not needing approval. The present research investigates the influence of an intervention aimed at quality improvement of the medication-prescribing process. The integrity of the patient is therefore not influenced by the intervention and, according to the Medical Ethics Law; the study is not subjected to medical ethical approval. All data were collected anonymously.

Activities during the baseline period and data collection

During the baseline period, which is of 1 week we starting with studied maximum literature or journals on medication errors in which the most important and precise literature is the report of To Err is Human, medical errors have been of major concern worldwide. In baseline period pharmacist evaluated each new medication order for its appropriateness for given indication, duration of therapy, drug dosage and frequency, risk of drug-drug and drug-disease interactions; the medication scheme as whole was checked for pharmacological duplications and drug omissions. The international and national pharmacotherapy guidelines and local evidence- based pharmacotherapy protocols were used for this evaluation. One of the most important thing in baseline period is that the pharmacist that evaluate the medication errors in medication order is not consulted to the physician after evaluate.

For each detected prescribing issue, the ICU hospital pharmacist recorded the date, patient characteristics (age, sex, weight, Acute Physiology and Chronic Health Evaluation), medication details and the pharmacist's recommendation. For ethical reasons, these recommendations were corrected by pharmacists himself if the errors were at high level and the pharmacist scored the related prescribing issue as a prescribing error.

Subsequently, prescribing errors were categorized by type and by severity at the time of detection, according to The National Coordinating Council for Medication Error Reporting and Prevention (NCCMERP) classification. If patient harm occurred, the Common Terminology Criteria for Adverse Events criteria were used to objectively grade the magnitude of harm. According to these criteria, patient harm was categorized as mild, moderate, severe, life threatening or leading to death. The initial classification of the prescribing error type (grouping into a NCC-MERP category) was performed by the pharmacist who detected the prescribing error. [6]

Activities during the intervention period and data collection

During the intervention period, all physicians were informed about the study and medication errors. The method of data collection and medication order review by pharmacists was the same as during the baseline period. The detected prescribing issues and the recommendations, however, were discussed with the attending physicians. If consensus was reached between the hospital pharmacist and the attending physicians on a recommendation regarding a prescribing issue, then that issue was scored as a prescribing error and the medication order was corrected by the responsible physician. If consensus could not be reached, the prescribing issue was not scored as a prescribing error and the medication order was regarded as appropriate. Our intention was to carry out the proposed activities every weekday.[7]

Table I Criteria for medication errors

Stage	Definition	Error types
Ordering	Unambiguous prescription	Omission of: drug name; drug formulation; route; dose; dosing regime; date; signature; treatment time for antibiotics
Transcription	An identical copy of prescription in medical record	Discrepancy in: drug name; drug formulation; route; dose; dosing regime; omission of drug; unordered drug
Dispensing	Dispensed medication is concordant with prescribed drug in nurse medication chart	Unordered drug (wrong drug); unordered dose; omission of dose; wrong dose; wrong drug formulation
Administering	The right medication to the right patient in the right way and at the right time	Wrong: administration technique (inj.); route; time (± 60 min); delivery (dose not delivered directly to the patient); unordered drug; unordered dose; omission of dose; lack of identity control
Discharge summaries	Eligible prescriptions in medical record are identical to prescriptions in discharge summaries	Discrepancy in: drug name; drug formulation; route; dose; regime; omission of drug; unordered drug

Statistical analyses

The data were analyzed by using SPSS 16.0 (SPSS Inc.). Frequencies were described as percentages and the descriptive data as mean or median, if appropriate. Subjects from the baseline population were compared with those from the intervention population using the unpaired Student t test or the Mann-Whitney U test for continuous data and using the chi-square test for categorical data. Two-sided Fisher's exact tests were used for the comparison of incidences of prescribing errors between the study periods. A multivariate, backward logistic regression analysis was applied to calculate odds ratios of finding a prescribing error by clinical pharmacists.[8]

Ethical aspects

The investigator was ethically obliged to interfere immediately if a medication error was observed and the interference would precede before the administered the medication. All medication errors prevented by the investigator would be registered as a medication error.[9]

Results

Opportunities for errors were independently summed up for each stage in the medication process. In total 100 opportunities for errors were registered of which 43 (43%) errors were detected. The ratios of medication errors in hospital than as compared to the other clinical setups are almost equal. The estimated median error in every 10 patients is about 50%. There was no statistical difference between the error rate per patient in the hospital pharmacy and in independent retail pharmacy.[10]

The overall percentage of prescriptions errors according to their types are given in table given below:

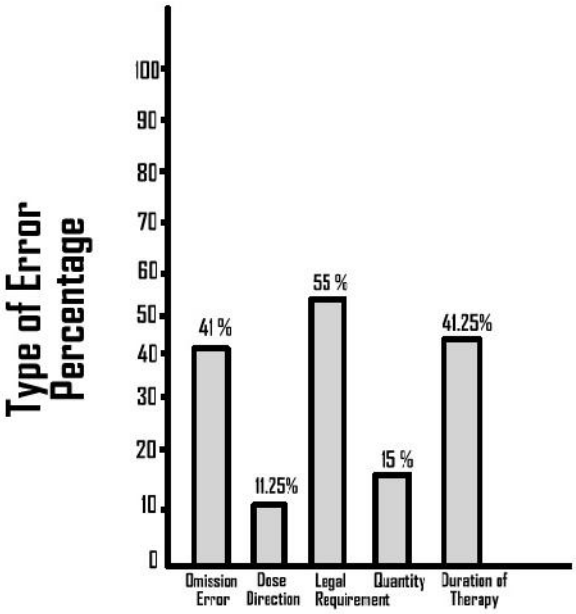
OMISSION ERROR		
a)	**Dispense As Written**	**100%**
b)	**Refill Quantity**	**57%**
c)	**Dosage Form**	**0%**
d)	**Length of Therapy**	**35%**
e)	**Patient Allergies**	**82 %**
f)	**Date**	**12.5%**
g)	**Route**	**15%**
h)	**Signature**	**30%**

DOSE DIRECTIONS		
a)	**Error in Dose**	**5%**
b)	**Unavailable Dosage Forms**	**0%**
c)	**Unavailable Strengths**	**20%**
d)	**Misleading, Incomplete or Confusing Direction**	**5%**
e)	**Take as Directed**	**35%**
f)	**Sustain Release Dosage Forms**	**2.5%**

LEGAL REQUIREMENTS		
a)	**Omission of DEA Number**	**100%**
b)	**Omission of Patient Address**	**97.5%**
c)	**Prescription Refilled for Class II Drugs**	**Not Find Out In Prescription**
d)	**Partial Filling of Class II Drugs**	**12.5 %**
e)	**Inappropriate Prescription**	**10%**

QUANTITY		
a)	**Unclear Amount**	**25%**
b)	**Dosage does not Exist**	**5%**

DURATION OF THERAPY		
a)	**Different from Normal Standard**	**25%**
b)	**Not Specified**	**32.5%**



The percentage of omission error, dose direction error, legal requirement error, and quantity mentioned error and duration of therapy error is 41%, 11.25%, 55%, 15% and 41.25% respectively which is show in following above graph.

Discussion

Our findings of 43% errors in the medication process indicate a need for improvement in more stages of the medication process. None of the errors identified affected the patients' health but one-fifth was assessed as being potentially serious or fatal in a worst case scenario. The high percentage of identified errors must be viewed in the light of the detailed and systematic examination of errors and types of error at each stage of the medication process.

Ordering and transcription stage

Previous studies have suggested a need for a unified medication system to eliminate errors at the ordering and transcription stage. This medication chart, paper or electronic, should clearly state the components needed to fulfil requirements for unambiguous prescription—especially drug form and route, as these were the most frequent types of error in our study. The high frequency of discrepancies in drug form between medical records and medication charts were caused by interpretation of drug prescriptions, and lack of drug formulation in the medical record. Often, these interpretations are correct and improve the quality of the drug prescription, but these actions are result in fatal consequences for the patients.[11]

Dispensing and administration stage

Compared with previous studies of medication errors identified through observational studies, error rates in our study varied. Possible explanations of the low frequency of dispensing errors identified in our study, could be differences in study population or observed drug forms as well as differences in the drug distribution system. Furthermore, it can be assumed that the inclusion of specialized pharmaceutical variables such as excess of intravenous drug duration, incorrect dilution of drug, wrong storage of drug, and use of expired drug have contributed to a higher error rate in previous studies.[12]

Our aim was to explore whether dispensing and administration of medication were concordant with prescribed medication in the medication charts in respect of drug name, dose, drug form, time, drug route, administration technique, and giving drugs to the right patient, including identity control before administering medication. Pharmaceutical variables such as wrong storage and use of expired drugs were not included as these were controlled by pharmacists.

Controlling the patient's identity before administered medication was not a standard routine in the Pakistan. There is thus a real risk gap in the medication process that needs to be bridged by improved procedures or new technologies such as bar code medication administration although this could introduce new paths for medication errors and adverse drug events.

Discharge Summaries

Discharge summaries had the highest percentage of errors constituting almost half of all errors detected in the present study. Previous studies investigating medication in discharge summaries and in medical records have shown discrepancy in 16–36% of prescribed drugs. Still, more than twice as many errors were identified in our study, presumably as a consequence of the stringent and detailed criteria of the present design. Whether these criteria were too idealistic, in comparison with clinical practice could be discussed. Yet, the systematic information collected in the present study points out weaknesses in existing practice. For example, more than two-thirds of the identified errors were caused by lack of transcribing eligible prescriptions into discharge summaries, due to lack of discontinuing expired drug prescriptions. These findings, among others, stress a need for general and unambiguous guidelines for drug prescriptions in discharge summaries.

Study Limitations

Our study has several limitations. First, it was performed in only specific hospitals and pharmacies, which could reduce generalization of our findings to other clinical settings. However, because the reduction of prescribing errors and related harm was substantial in our study, and those results were in line with earlier published findings, it is highly probable that comparable beneficial effects will be achieved when similar in pharmacies participation programs will be implemented in other pharmacy settings.

Second, our study was not designed as a randomized controlled trial, and therefore could be biased by a large number of causes. However, such a refined study design is very time consuming, and is mostly chosen for interventions of which the effects have already been explored by studies with less sophisticated designs. To our knowledge, this is the first study that has investigated the effect of pharmacies participation program designed for a clinical pharmacist in a Pakistan; our priority was therefore to conduct a practical study to explore the potential added value of this approach to medication safety in clinical setups.[13]

Conclusion

Limited documentation in patient medical records and the questionable currency of guidelines are possible factors contributing the frequency of non-consistent therapy.

It is important to note that the use of guidelines is just one element of good medical decision making. This project has not considered specific patient factors that might have influenced prescribing decisions. Nor has it sought to identify the barriers to the use of existing guidelines by prescribers. These may be fruitful areas for future study.

Finally, the results of this project have further demonstrated the feasibility of undertaking multi-center drug use evaluation, with modest financial support, yielding important information on prescribing patterns.[11]

Novelty of Work:

- The present study is the first study in The Pakistan evaluating the effect of a clinical pharmacist on prescribing errors and related patient harm in retail pharmacies.
- The incidences of prescribing errors and related patient harm were reduced significantly.
- Even in settings with less resources and not well established clinical pharmacy services, a hospital pharmacist can play an important role in enhancing medication safety.
- By evaluating the types of prescribing errors found and by analyzing selected patient characteristics, we were able to identify risks for prescribing errors. This risk stratification will help us to improve our medication errors in the future and could make the program more efficient and effective.[13]

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How to cite this article:
Shumaila Arshad, Hafiz Muhammad Abdullah, Manan Bhatti. (2016). Evaluation of prescription errors in hospital and other clinical setups of Pakistan. Int. J. Adv. Res. Biol. Sci. 3(6): 68-75.