Original article:
Evaluation of Errors in Prescription Writing: A Cross-Sectional Study at Community Pharmacies and Tertiary Care Hospitals of Lahore, Pakistan.
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Abstract
Background: Prescription errors often lead to mishaps around healthcare facility that often end up with adverse drug reactions and even some cases death. Being in a healthcare facility the patient should have full confidence in the health care providers and not have to worry about minor mistakes leading to a possible lethal one. Aim and objective: The aims and objectives of our study is to evaluate the prescription writing errors in different community pharmacies and tertiary care hospitals also to assess the knowledge of patients regarding their disease and treatment.

Introduction
Patient safety is a growing concern since November 1999 because of the release of the Institute of Medicine report in which health care experts were astonished to discover that blunders including physician endorsed pharmaceuticals are responsible up to 7000 American casualties for each year with money related medication related dismalness and mortality costing up to $77 billion a year. As time has advanced, this issue has not diminished and it’s a persistent developing concern even starting now in 2015. Solution mistakes may leads to wounds and misuse of cash. The National Coordinating Council for Medication Error and Prevention has a working definition for prescription mistake as, “Any preventable occasion that may bring about or lead to unseemly drug use or patient damage, while the pharmaceutical is in the control of the medicinal services proficient, patient, or shopper. Such occasions might be identified with expert practice, social insurance items, and frameworks including: endorsing, requesting correspondence, item naming, bundling and terminology, intensifying, administering, circulation, organization, training, checking and utilizing.” Taking into account this definition, it can be inferred that pharmaceutical mistakes don’t generally fundamentally come from specialist’s solution yet can be engendered from any social insurance administration given to the patient and can even be the patients blame by and large. Drug errors related patient tragedies has expanded from 198,000 in 1995 to 218,000 in 2000 which

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prompt US economy expenses of these mistakes to more than $177 billion every year\(^2\). Drug blunders are a typical mix-up happening comprehensively around the globe and more pervasive in specific nations than others. The blunders can go from the oversights of specialists, medical attendants, drug specialists and even the patients. Further research demonstrates that wounds because of drug blunders are not only the shortcoming of one individual social insurance supplier but instead, because of the disappointment of an intricate human services framework\(^3\). This further supports the definition expressed by The National Coordinating Council for Medication Error and Prevention. The worry isn’t simply with grown-up patients yet even youngsters which incorporates babies. In 2000, a gathering of specialists on gaining from antagonistic occasions reported that subsequent to 1985 there were no less than 13 scenes in which kids (for the most part) had been murdered or incapacitated in light of the fact that the wrong organization of medications by spinal rope infusion, 12 required in vinca alkaloids, and 10 were deadly\(^4\). This examination demonstrates a lot of worry as treatment may end with death for the youngsters or may even devastate their lives creating additional agony and misfortune to both the patient and close family. It is asserted that around 1 to 10% of drug blunders are connected with patient damage\(^5\). Besides, poor written work of medicines prompts error of medication measurement or medication organization timings\(^6\). Then again, the rate of restorative blunders all through the world is high to the point that is represented one of the five noteworthy reasons for casualties.

**Materials and Methods**

**Materials**
To assess the likely impacts of prescription errors on patients regarding their disease and treatment, a literature search was undertaken using Web of Science and Google Scholar as data bank. Following chapters includes the literature review of various research article related to the medication errors associated with prescribing patterns support this work. The literature survey is described in the following Table 1.

**Table 1: Literature Review**

| Author          | Country | Year | Sample size | Design                  | Findings                                                                 |
|-----------------|---------|------|-------------|-------------------------|-------------------------------------------------------------------------|
| Bates et al. [5] | USA     | 1995 | 379 patients| Cohort study            | Medication errors are common, although relatively few results in ADEs that could be prevented via electronic prescription orders by physicians. |
| Barker et al. [7]| USA     | 2002 | 3216 doses  | A prospective cohort study | Medication errors were common (nearly 1 of every 5 doses in the typical hospital and skilled nursing facility). The percentage of errors rated potentially harmful was 7%, or more than 40 per day in a typical 300-patient facility |
| Phillips et al. [8]| USA | 2001 | 5366       | Prospective            | 469 fatal medication error reports, 48.6% occurred in patients over 60 years. Improper dose (40.9%) wrong drug (16%) wrong route(9.5%) |
| Dean et al. [9]  | UK      | 2002 | 36200      | Prospective study      | 135 prescribing errors identified each week, of which 34 were potentially serious |
| Ross et al.[10]  | UK      | 2000 | 195 areas  | Retrospective          | The overall medication error rate was low. Medication errors occurred in 0.15% of admissions While the highest rate occurred in neonatal intensive care (0.98%), A total of 195 errors were reported over a 65 month period |
Table 1: Literature Review (continued)

| Author            | Country     | Year | Sample size       | Design             | Findings                                                                 |
|-------------------|-------------|------|-------------------|--------------------|--------------------------------------------------------------------------|
| Schwartz et al.   | USA         | 1962 | 178 elderly patients | Prospective study  | In 178 patients, averaged 1.5 errors per prescription. And major reason is inaccurate knowledge followed by errors in self-medication. |
| Coombes et al.    | Australia   | 2008 | 14 prescribers    | prospective study  | Lack of drug knowledge was not the single causative factor in any incident |
| Calligaris et al. | Italy       | 2009 | 756 inpatients    | Prospective        | Overall 23.9% of prescriptions were illegible and 29.9% of prescriptions were incomplete. Legibility and completeness are higher in unusual drugs prescriptions. The survey confirms the extensive use of antibiotics in an acute care hospital. |
| Morimoto et al.   | USA         | 2004 | 27617 patients    | Prospective Cohort | To reduce the likelihood of harm related to medications                  |

Research Instruments

A 33-item questionnaire was used to assess patient’s knowledge (provided by health care professional) regarding their disease/illness and its treatment, and prescription errors made by the prescriber. This questionnaire was designed by the researchers after extensive literature review comprising Section A which had 9 questions to obtain general characteristics of study participants. Section B had 8 questions to assess patient’s knowledge (given by health care provider) about their ailment and its treatment. Section C had 16 questions to evaluate the prescription errors made by the prescriber. The questionnaire was thoroughly reviewed by two lecturers of Clinical Pharmacy at University College of Pharmacy, University of the Punjab, Lahore, Pakistan. Based on the recommendation of the reviewers, amendments were made with regard to arrangement and structure of questions.

Statistical analysis

Continuous variables were presented as mean and standard deviation (SD) while categorical variables will be expressed in numbers or percentages. All statistical analysis were performed using SPSS version 21.0 (SPSS Inc., Chicago, IL) for Windows.

Method

A cross-sectional study was conducted in six community pharmacies and two tertiary care hospitals namely Mayo hospital and Jinnah hospital, Lahore, Pakistan.

Sampling procedure

A convenient sampling technique was used to enroll all the eligible patients who met the inclusion criteria and gave consent to participate in the study.

Inclusion criteria

Inclusion criteria of patients for the present study are as follows:
- Male or female patients above age 40 years
- Patients visiting the aforementioned study settings

Exclusion criteria

- Patients visiting pharmacies to purchase things other than medicine.
- Patients age < 40 years

Data collection period

Data collection period for the current study was 3 months (1st February to 30th April 2016)

Ethical approval

Permission to conduct this study was obtained from College of Pharmacy, University of Punjab Lahore Pakistan.

Results

A total of 560 prescriptions were included in current study. Characteristics of study sample are given in Table 2. There was a predominance of male belonging to 40-49 years of age group. Majority of prescription were from private hospitals and clinics. We found out that 60.4% prescriptions were from private hospitals and clinics and 39.6% of prescriptions were from Govt. Hospitals. Most of the doctors prescribed drugs with brand names.
Table 2: Demographics of the study cohort

| Characteristics       | N     | %   |
|-----------------------|-------|-----|
| **Gender**            |       |     |
| Male                  | 310   | 55.4|
| Female                | 250   | 44.6|
| **Age**               |       |     |
| 40-49                 | 281   | 50.2|
| 50-59                 | 183   | 32.7|
| 60-69                 | 71    | 12.7|
| ≥ 70                  | 25    | 4.5 |
| **Occupation**        |       |     |
| Self-employed         | 159   | 28.4|
| Salary worker         | 113   | 20.2|
| Un-employed           | 288   | 51.4|
| **Residence**         |       |     |
| Urban                 | 413   | 73.8|
| Rural                 | 147   | 26.3|
| **Prescription type** |       |     |
| Hand written          | 535   | 95.5|
| Electronic            | 7     | 1.3 |
| Printed               | 18    | 3.2 |
| **Legibility of prescription** |     |     |
| Legible               | 434   | 77.5|
| illegible             | 126   | 22.5|
| **Prescription is from** |     |     |
| Govt. hospital        | 222   | 39.6|
| Private hospital/clinics | 338  | 60.4|

Table 3: Knowledge of patients regarding their disease and treatment

| Response                                                                 | N (%)   |
|--------------------------------------------------------------------------|---------|
| Did you receive information about your disease?                         |         |
|   Yes                                                                    | 457 (81.6) |
|   No                                                                     | 103 (18.4) |
|   I don’t know                                                           | --      |
| Did you receive information about your medication?                       |         |
|   Yes                                                                    | 331 (59.1) |
|   No                                                                     | 229 (40.9) |
|   I don’t know                                                           | --      |
| Did you receive information about your treatment?                        |         |
|   Yes                                                                    | 350 (62.5) |
|   No                                                                     | 210 (37.5) |
|   I don’t know                                                           | --      |
| Do you know which activities are allowed at home?                        |         |
|   Yes                                                                    | 206 (36.8) |
|   No                                                                     | 354 (63.2) |
|   I don’t know                                                           | --      |
| Do you know about the side effects of medications you are currently on? |         |
|   Yes                                                                    | 171 (30.5) |
|   No                                                                     | 389 (69.5) |
|   I don’t know                                                           | --      |
| Do you know when to contact your health care provider?                   |         |
|   Yes                                                                    | 204 (36.4) |
|   No                                                                     | 356 (63.6) |
|   I don’t know                                                           | --      |
| Do you know about correct dose, timing and frequency of your medication?|         |
|   Yes                                                                    | 393 (70.2) |
|   No                                                                     | 167 (29.8) |
|   I don’t know                                                           | --      |
| Can you reach your doctor/pharmacist for medication-related problems?    |         |
|   Yes                                                                    | 261 (46.6) |
|   No                                                                     | 299 (53.4) |
|   I don’t know                                                           | --      |

Knowledge of patients regarding their treatment and side effects are shown in table 3. We observed that majority of patient were not given proper information about side effects of drugs. Mostly patients knew about their medication. Maximum numbers of patient were properly counseled about their dose, timing and frequency of their medication.

Knowledge of patients regarding their disease and its treatment was assessed by giving 1 to right answer (yes) and 0 to wrong answer (no and I don’t know). The scale measured knowledge from maximum 8 to minimum 0, with high score indicating good knowledge. The mean knowledge score of study cohort was 4.21 ± 2.14.
Major focus of our study was on prescription errors which are shown in the study sample of table 4. There was very alarming situation that most of prescriber (69.5%) did not give instruction to pharmacist. Only 62.9% of prescriptions had signature of prescriber on it. We noticed that an average of 6.34 errors per prescription.

Table 4: Prescription errors in the study sample (Continued)

| Response                        | N (%)  |
|---------------------------------|--------|
| **Route of administration:**    |        |
| Mentioned                       | 284 (50.7) |
| Not mentioned                   | 276 (49.3) |
| **Rate of administration:**     |        |
| Mentioned                       | 166 (29.6) |
| Not mentioned                   | 394 (70.4) |
| **Time of administration:**     |        |
| Mentioned                       | 388 (69.3) |
| Not mentioned                   | 172 (30.7) |
| **Frequency of administration** |        |
| Mentioned                       | 263 (47.0) |
| Not mentioned                   | 297 (53.0) |
| **Re-fill**                     |        |
| Mentioned                       | 46 (8.2) |
| Not mentioned                   | 514 (91.8) |

Number of errors per prescription was assessed by giving 1 to incorrect prescription writing practice and 0 to correct. The scale identified errors ranges from minimum 0 to maximum 16. The mean number of errors identified in the study cohort was 6.36 ± 2.84.

Discussion

The main findings of our study revealed that current practice of prescription writing is not of appropriate standards. We found several errors in prescription writing. Prescription parameters such as patient name, address, date, Rx, inscription, subscription, signa and prescriber’s signature are parts of prescription. Most common errors were associated with the parts of prescription including absence of, “subscription” which is the instruction of prescriber to the pharmacist and, “signa” which is directions of physician to the patient about medication use and care plan. Besides the errors of parts of prescription another interesting thing, was the information about the dosage regimen i.e. dose, dosage form, frequency, route of administration and duration of course etc. the clinicians are very much conscious and clear in mentioning about all these aspects of dosage regimen. This depicts the rational prescribing of clinicians in current scenario of our community. We also assessed the information delivered to the patient by the health care provider. Although the information about disease, treatment and medication was given to the patient but side effects and/or adverse effects
associated with the medication and who to contact in emergency situations, were not properly addressed. Contrary to the findings of an earlier study\textsuperscript{11}, we found an average 5 times more error per prescription. The probable reason for this high rate could be inappropriate behavior of the prescriber, illegible handwriting and less use of modern ways e.g. printed prescription. This can also be attributable to not following the international standards of prescription writing. The less number of errors in prescription writing in the previous study\textsuperscript{11} was mainly due to the harmonization with the standards and compulsion by the law and enforcement by the health organizations. Our findings regarding the prescription legibility and incompleteness of medication orders are comparable to the results of a previous study\textsuperscript{13}. The reason behind the excessive errors was the unreadable handwriting of the prescribers which can lead to the dispensing of the lookalike sound alike (LASA) drugs. Only the electronic advancement can improve this highlighted issue and remove the hurdles towards the rational prescribing.

We did not use a probability sampling method e.g. random sampling, and therefore we had disadvantages such as selection biasness. There can also be selective biasness for study settings. Also we had a concise sample size. We did not include medical stores in our investigation where the selling of non-prescription drugs is excessive as there is no pharmacist present.

Our findings highlight the need of computer aided programs and software which can monitor the prescriptions and minimize drug interactions, adverse drug reactions and medication order related errors.

In current situation there should be a check and balance system that can efficiently work and reduce such errors. Health care provider should organize seminars and orientations for general practitioners and clinicians to keep them in the loop about the current international practices of prescription writing.

**Conclusion**

Errors in prescription writing are frequent in both public and private hospitals/clinics. There is not a single effective way of reducing these errors instead multiple approaches needs to be enforced to bring about near perfect health care practice such as theoretical and practical teaching coupled with frequent assessment of knowledge and skills acquired by new training students and employing electronic prescriptions.

**Conflict of Interest**

The Authors have no competing interest exist.

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