



ORIGINAL ARTICLE

Factors contributing to the identification and prevention of incorrect drug prescribing errors in outpatient setting



Salma Al-Khani ^{a,*}, Amani Moharram ^a, Hisham Aljadhey ^b

^a King Faisal Specialist Hospital and Research Center, Pharmaceutical Services Division, Riyadh, Saudi Arabia

^b Medication Safety Research Chair, King Saud University, Riyadh, Saudi Arabia

Received 18 August 2013; accepted 10 November 2013

Available online 19 November 2013

KEYWORDS

Medication errors;
Wrong drug;
Medication indication

Abstract Purpose: Medication errors in prescribing are common and could lead to high morbidity and mortality. The objective of the current study was to explore factors that help pharmacists identify and thus prevent harm from incorrect drug prescribing errors in an ambulatory care setting.

Methods: At the King Faisal Specialist Hospital and Research Center, a tertiary care referral hospital in Riyadh, Saudi Arabia, medication error reports from the pharmacy are initiated by the pharmacist and reviewed by the quality control department and medication safety officer. This was a retrospective study in the hospital ambulatory care pharmacies including incorrect drug error reports from January 2011 until September 2012. Reports were reviewed by two pharmacists to ensure the accuracy of data classification. Factors contributing to the identification of incorrect drug prescribing errors were identified.

Results: During the study period, a total of 2073 prescribing errors were included in the hospital Safety Reporting System. Incorrect drug prescribing errors identified by pharmacists comprised 203 reports (10%). Factors contributing to the identification of incorrect drug prescribing errors were: matching the drug with the indication for prescribing included in the prescription (34%), reviewing the patient's medication history (27%), patient counseling and review of medication history (9%), patient counseling during dispensing (8%), others (15%), and not specified by the reporter (7%).

* Corresponding author. Tel.: +966 1 464 7272x37672; fax: +966 1 442 7608.

E-mail address: SAKhani@kfshrc.edu.sa (S. Al-Khani).

Peer review under responsibility of King Saud University.



Production and hosting by Elsevier

Conclusions: Pharmacists reviewing and matching the indication for prescribing the prescribed drug and reviewing patient medication history before dispensing were the major factors (60%) found that allowed pharmacists to detect and thus prevent incorrect drug prescribing errors. Therefore, including the indication in the prescription as a mandatory field is important for patient safety.

© 2013 King Saud University. Production and hosting by Elsevier B.V. All rights reserved.

1. Introduction

Medication errors are any barrier that prevents the right patient from receiving the right drug in the right dose at the right time through the right route of administration, at any stage in the medication use process, with or without the occurrence of adverse drug event (ADEs) (California Healthcare Foundation, 2001). It represents the largest single cause of errors in the hospital setting in the United States, and exceeds the number of deaths from motor vehicle accidents, breast cancer or AIDS (Kohn et al., 1999).

Medication errors are an important leading cause of patient mortality and morbidity in hospitals (Lazarou et al., 1998; Barber and Rawlins, 2003; Philips et al., 2001). On the other hand, it is considered one of the most challenging problems in any health care system; in the United States, medication errors are estimated to harm at least 1.5 million patients per year (Agrawal, 2009). Furthermore, one out of every 131 outpatient deaths is related to medication errors, and it has been estimated that medication errors cost the US healthcare system around \$177 billion annually (Kohn et al., 1999).

Medication errors in the United States account for more than 7000 deaths annually, which is greater than the number of deaths caused by injuries at work (California Healthcare Foundation, 2001), and is ranked between the fourth and sixth leading causes of death (Lazarou et al., 1998). In addition, prescribing errors account for nearly 1 in 20 hospital admissions, this is an admission rate similar to that of cancer.

Prescriptions are the primary means of communicating medication information and instructions between prescribers and pharmacists (Kennedy et al., 2011). A medication prescribing error is defined as “a prescribing decision or prescription writing process that results in an unintentional, significant reduction in the probability of treatment being timely and effective or increase in the risk of harm, when compared with generally accepted practice” (Dean et al., 2000).

It has been estimated by some studies carried out in different US hospitals that prescribing errors occur in 0.4–1.9% of all medication orders written, and cause harm in about 1% of all inpatients (Leasar et al., 1997). In the United Kingdom, the incidence of medication prescribing errors is similar to that of the United States (Barber and Rawlins, 2003).

The most common prescribing errors are: incorrect drug, incorrect dose, allergies, and drug–drug interactions (Agrawal, 2009). Another study concluded that 11.4% of medication prescribing errors are associated with the use of an incorrect drug name, dosage form or abbreviation (Leasar et al., 1997). Incorrect drug medication errors could lead to severe harm to the patient and should attract special attention. The objective of the current study was to explore factors that help pharmacists identify and thus prevent harm from incorrect drug prescribing errors in an ambulatory care setting.

2. Methods

This was a retrospective study in the ambulatory care pharmacies at the King Faisal Specialist Hospital and Research Center (KFSH&RC), including incorrect drug error reports from January 2011 until September 2012. KFSH&RC is a tertiary referral hospital located in Riyadh, Saudi Arabia, with more than 1000 tertiary care beds. The Hospital and Research Centre has a total of 6946 staff members, comprising 63 different nationalities, there are 18 medical departments. The hospital medical staff, including Residents and Fellows, includes about 703 physicians, 54% of whom are Saudi citizens. The Pharmaceutical Care Division is composed of three departments: the Ambulatory Care Pharmacy, the Medical/Critical Care Pharmacy, and the Medication Safety/Clinical Pharmacy Support Services. The Division provides comprehensive, 24-h computerized distribution and dispensing services to both inpatients and outpatients, with a patient-focused and integrated model of pharmaceutical care. It has around 235 personnel, 28 of whom are clinical pharmacists in different clinical practice areas in addition to a quality coordinator and a medication safety officer.

The hospital electronic adverse events reporting system is a voluntary reporting system that was launched in 2007. Medication error reports from the pharmacy are initiated by the pharmacist and reviewed by the quality control department and medication safety officer. The medication variances in this system are divided into six main categories based on the medication use process: purchasing and storing, prescribing, transcribing and order transmission, preparing and dispensing, administering, and monitoring. These categories are subdivided into different medication error types. For example, medication prescribing errors are divided into around 40 different types including incorrect drug, incorrect dose, incorrect frequency, incorrect patient, unauthorized medication prescribing, protocols not followed, omission, etc.

In this study, the reported medication prescribing errors in the KFSH&RC Safety Reporting System were thoroughly reviewed and evaluated by two researchers. Subsequently, the researchers reviewed only incorrect drug prescribing errors to ensure the accuracy of data classification. Factors contributing to the identification of incorrect drug prescribing errors were identified. Descriptive statistics were used to analyze the data (frequency and percentages). Data were analyzed using Microsoft Excel 2010 software. The study was approved by the hospital Office of Research Affairs (ORA).

3. Results

During the period from January 2011 to September 2012, a total of 2073 prescribing errors were reported in the hospital Safety Reporting System. Table 1 lists the most common types of reported medication prescribing errors. Incorrect drug

Table 1 The most common types of reported medication prescribing errors.

Error type	Frequency
Wrong dose	1099 (53%)
Wrong drug	203 (10%)
Wrong frequency	180 (9%)
Two conflicting doses	130
Duplication	73
Incomplete order	65
Wrong duration	49
Wrong patient	43
Unauthorized/non-approved drug prescribed	39
Wrong or unspecified dosage form	30
Others	162
Total	2073

prescribing errors occurred at a rate of 10% (203 reports). [Table 2](#) lists the top 10 medications involved in incorrect drug prescribing errors. 13% of these errors was found have occurred with high alert medications.

The factors that allowed the pharmacist to identify incorrect drug prescribing errors before dispensing the medication were: reviewing the mandatory electronic prescription indication field (34%), reviewing the patient medication history (27%), others, for example, unapproved patient population, unapproved medication, incorrect dose (15%), patient counseling and reviewing patient medication history (9%), patient counseling during medication dispensing (8%), and not indicated in the reported Safety Reporting System SRS (7%).

4. Discussion

Incorrect drug prescribing errors are a known challenge in any healthcare setting; the same applies at the KFSH&RC, where it was shown that incorrect drug was the second reported medication prescribing error ([Table 1](#)). The current study found that matching the drug with the indication included in the prescription, reviewing the patient's medication history, and patient counseling helped the pharmacist identify incorrect drug errors and correct them before reaching the patient.

Incorrect drug errors can happen for several reasons, one of which is medication names that look alike or sound alike (LASA). As shown in [Table 2](#), the top ten reported medication

Table 2 Top 10 medications involved in wrong drug prescribing error.

Prescribed drug	Intended drug
Levomepromazine ^a	Levothyroxine ^a
Vitamin D 400 units	Vitamin E 400 units
Penicillamine ^a	Penicillin V ^a
Phenytoin	Phenobarbital
Pulmozyme®	Pulmicort®
Imuran®	Neoral®
Flixonase®	Flixotide®
Azathioprine ^a	Azithromycin ^a
Cyclophosphamide ^a	Cyclosporine ^a
Cyclosporine ^a	Cycloserin ^a

^a Indicate the use of Tallman letters for the medication name display in the hospital CPOE system.

errors had clear LASA issues, which could have led to selecting the incorrect medication during prescribing. Several preventive measures are recommended to minimize errors with LASA medication names such as utilizing the Tallman letter system in writing medication names (mixed-case or enlarged letters to emphasize the differing part of similar medication names, e.g. “predniSONE” and “prednisoLONE”). Research has shown that this approach can effectively help health care practitioners to differentiate medication names and minimize confusion and errors ([Filik et al., 2004](#), [Hoffman and Paroulx, 2003](#)). This approach is currently implemented at the KFSH&RC to a selected list of medication names as per the approved hospital management LASA medication names policy.

The results of this study indicate that reviewing the medication indication for the prescribed medication helped the pharmacist to prevent around 35% of the total reported medication incorrect drug prescribing errors. In these cases, the pharmacist was able to identify the incorrect drug based on the reason for prescribing this medication to the patient. On the other hand, physician compliance in writing or selecting the correct indication in the electronic prescription is still a challenge in the hospital. Moreover, despite the fact that the medication indication field in the hospital computerized prescribing system is a mandatory field, some physicians might override this feature by writing characters or letters rather than typing or selecting the appropriate indication. This issue had been addressed several times by the hospital administration and the compliance rate has been improving, as indicated by several pharmacists.

Some studies have concluded that including the indication for prescribing in each prescription might help the pharmacist detect medication prescribing errors ([William, 2011](#)). In addition, including the indication would improve pharmacist communication with the patient, and consequently improve patient adherence to the prescribed medication ([Teichman and Caffee, 2002](#)). Different studies have suggested some modifications to their current medication prescription form that includes extra fields, such as a special field for the physician to write the medication indication for the prescription upon prescribing, in addition to several other modifications with the aim of reducing medication prescribing errors ([Kennedy et al., 2011](#)). Therefore, the [American Society of Health System Pharmacist \(ASHP\)](#) has recommended that the desired therapeutic outcome for each drug should be expressed when the drug is prescribed in order to prevent medication errors (Best Practices, ASHP). The [Institute for Safe Medication Practices \(ISMP\)](#) has recommended that prescription orders should include a brief notation on the purpose or medication use indication (e.g. for cough) unless it is considered inappropriate by the prescriber. A medication use indication can further help to assure that the correct medication is prescribed, which is considered an extra safety check point in the medication use process (ISMP).

The use of technology throughout the medication use process is known to be helpful in preventing medication prescribing errors in several ways ([Agrawal, 2009](#)), since having an accurate patient medication list will help prescribers and pharmacists review the patient medication history and consequently alert the pharmacist to communicate with the prescriber in the case of any unexplained change in the prescribed medication.

In addition, our study, similar to previous studies (Cohen, 2007), indicated that patient counseling by the pharmacist during the medication dispensing process helped the pharmacist to identify and prevent several incorrect drug prescribing errors, through discussing the prescribed medication with the patient and educating them on the proper use of this medication, including the indication for use, the dose and the frequency. This discussion gives the pharmacist the opportunity to identify any unintended changes in the patient medication treatment plan and confirm the change with the prescriber, and could serve as an extra safety check point in the medication use process to avoid errors and improve patient engagement in the treatment plan.

5. Conclusion

Pharmacists reviewing and matching the indication for prescribing with the prescribed drug and reviewing patient medication history before dispensing were the major factors (60%) that helped pharmacists detect and thus prevent incorrect drug prescribing errors. Therefore, including the indication in the prescription as a mandatory field is important for patient safety.

References

- Agrawal, A., 2009. Medication errors: prevention using information technology systems. *Br. J. Clin. Pharmacol.* 67 (6), 681–686.
- American Society of Health System Pharmacist. ASHP guidelines on preventing medication errors in hospitals, Medication Misadventures-Guidelines, 208–215, <www.ASHP.org> (accessed 10.08.2013).
- Barber, N., Rawlins, M., Dean Franklin, B., 2003. Reducing prescribing error: competence, control, and culture. *Qual. Saf. Health Care* 12 (Suppl. 1), i29–i32.
- California Healthcare Foundation by Protocare Sciences, 2001. Addressing Medication Errors in Hospitals. A framework for developing a plan.
- Cohen, M.R., 2007. Medication Errors. American Pharmacist Association, Washington, DC, pp. 205–231.
- Dean, B., Barber, N., Schachter, M., 2000. What is a prescribing error? *Qual. Health Care* 9, 233–237.
- Filik, R., Purdy, K.J., Gale, A.G., et al, 2004. Drug name confusion: evaluating the effectiveness of capital (“Tall Man”) letters using eye movement data. *Soc. Sci. Med.* 59 (12), 2597–2601.
- Hoffman, J.M., Paroulx, S.M., 2003. Medication errors caused by confusion of drug names. *Drug Saf.* 26 (7), 445–452.
- Institute for Safe Medication Practices. <www.ISMP.org> (accessed 06.08.12).
- Kennedy, A.G., Littenberg, P., Callas, P.W., Carney, J.K., 2011. Evaluation of a modified prescription form to address prescribing errors. *Am. J. Health Syst. Pharm.* 68, 151–157.
- Kohn, L.T., Corrigan, J.M., Donaldson, M.S., 1999. *To Err is Human: Building a Safer Health System*. National Academy Press, Washington, DC.
- Lazarou, J., Pomeranz, B.H., Corey, P.N., 1998. Incidence of adverse drug reactions in hospitalized patients. A meta-analysis of prospective studies. *JAMA* 279, 1200–1205.
- Leasar, T.S., Briceland, L., Stein, D.S., 1997. Factors related to errors in medication prescribing. *JAMA* 277, 312–317.
- Philips, J., Beam, S., Brinker, A., et al, 2001. Retrospective analysis of mortalities associated with medication errors. *AJHP* 58, 1824–1829.
- Peter G. Teichman, Anne E. Caffee, 2002. Prescription writing to maximize patient safety, family practice management, July/August 2002.
- William, N. Kelly, 2011. FISPE: Including indication when writing prescriptions. *Am. J. Health Syst. Pharm.*, 68.