academicJournals

Vol. 8(8), pp. 240-245, 28 February, 2014
DOI: 10.5897/AJPP2012.1500
ISSN 1996-0816

http://www.academicjournals.org/AJPP

African Journal of Pharmacy and Pharmacology

Full Length Research Paper

Nature and frequency of prescription modifications: An evaluation from the community pharmacy

Alina de las Mercedes Martínez Sánchez

Escuela Universitaria de Enfermería y Fisioterapia. Universidad de Castilla-La Mancha, Campus Tecnológico Antigua Fábrica de Armas Avda. Carlos III, s/n. 45071 Toledo, España.

Received 9 December, 2012; Accepted 21 February 2014

Medication errors can occur at any point in the medication use process. The present study was undertaken to investigate the frequency and nature of prescription modifications and pharmacist's interventions outcomes at the community pharmacy. A descriptive and prospective study was conducted and data were structured by all prescriptions that were modified by the pharmacy during the study. All medicines were classified into therapeutic groups using the Anatomical Therapeutic Chemical classification. A total of 20,205 prescriptions were processed during the study and the overall incidence of modifications by the community pharmacy was 10.9 % (2216 prescriptions). The majority (1676; 75.6%) of the reasons for the medications concerned the clarification of an insufficiently specified prescription. Drug-drug interaction (32.5%), contraindication (6.5%) or double medications (40.6%) were prevalent. The findings of this study reinforce the importance of prescription screening and interventions by pharmacists in reduce preventable adverse events attributed to medication errors. It also emphasizes the necessity of interdisciplinary communication and cooperation in identifying and resolving prescribing errors and irregularities in order to achieve optimal therapeutic outcomes for the patient.

Key words: Community pharmacy, medication error, pharmacist intervention.

INTRODUCTION

Patient safety has become a major concern since the November 1999 release of the Institute of Medicine (IOM) report, *To Err Is Human*. Health care practitioners may have been surprised to learn from this report that errors involving prescription medications are responsible for up to 7,000 American deaths per year and that the financial costs of drug-related morbidity and mortality may cost nearly $77 billion a year (Grissinger et al., 2003).

Medication errors can occur at any point in the medication use process. The prescribing step of the medication use process involves clinical decision making, selecting a treatment or drug regimen, documenting information in the

E-mail: saudade680227@yahoo.com

medical record, and ordering the selected drug treatment (IOM, 2007). Some of the reasons that errors occur during this stage of the medication use process are because prescribers do not use current available treatment evidence or available patient information, (i.e. allergy information, other medications, other conditions), do not follow set policies or procedures, fail to document appropriate information in the patient chart, or do not communicate the prescription appropriately (Giampaolo and Pietro, 2009; Ross et al., 2012). The dichotomous nature of community pharmacy practice is a critical dilemma for the profession. The role of community pharmacists has been traditionally characterized by dispensing prescrip-tion medicines, selling over-the-counter medication and offering healthcare advice. Community pharmacists are often not viewed as a core part of the primary healthcare team. Perceptions around being a retailer and healthcare provider create uncertainty in the minds of the medical profession, funders and consumers. Pharmacy is the only health profession that is reimbursed for its sale of a product rather than provision of a service (Rigby, 2010). In contrast; pharmacists are placed in an excellent posi-tion to promote rational use of medicines (for example, prescribing, dispensing, and use of drugs).

The literature on prescribing errors is gaining momen-tum, and the data so far suggests that the problem is not limited to any specific health care environment or defined practice setting. For example, a study developed in Galway (Ireland) to estimate the seriousness and level of prescribing errors that occurred in general practice reported 12.4% prescribing errors identified (Sayers, 2009). Similarly, pharmacists' interventions effectiveness have been demonstrated to come up with interventions that are most effective for impacting prescribing practice including audit and feedback, reminders, educational outreach visits, and patient-mediated interventions (Grindrod et al., 2006).

According to Hopper, though there is evidence pub-lished so far on prescribing errors, there is still a paucity of research reporting the role of pharmacists in identifying these errors and the prevalence of near-miss incidents in the prescribing process (Hopper et al., 2009). Therefore, the present study was undertaken to investigate the frequency and nature of prescription modifications and pharmacist's interventions outcomes at the community pharmacy.

METHODS

Setting and design

The study was conducted over a 4-month period (February 5- and June 15, 2011) at an urban community pharmacy in Madrid (Spain). The Community pharmacy is a shift of 12 hours, attached to Ambulatory Health Center, which dispenses about 4000 prescrip-tions each month. Like all community pharmacy in Spain, this is a private community pharmacy. In Spain, the Pharmacy Office (Community Pharmacy) is a private health establishment run for public interest, wherein autonomous communities are subject to health planning, with which the owner-pharmacist works through aides or assistants. The pharmacies dispense drugs to patients covered by the National Health System under the conditions set forth in the regulations.

The professional functions of pharmacists have changed from a passive to a more active role; now pharmacists personally follow up with patients (Bosch, 2000). The pharmacy technician assists the pharmacist in the dispensing of pharmaceutical products; controls inventory and the organization of pharmaceutical products; and evaluates the user's physiological parameters and vital signs under the pharmacist's supervision (Martínez-Sanchez, 2012). Ethical approval was obtained from the local research ethics committee.

The community pharmacy offers services like compounding, weight and blood pressure measurement, and cholesterol and glucose testing. A population of about 2000 inhabitants is served. Pharmacists and pharmacy technicians who worked there were invited to participate (3 pharmacists and 2 pharmacy technicians); eventually, 2 pharmacists and 2 pharmacy technicians agreed to partake. All participants received a pretested study protocol with definitions used, objectives and the methods to use during the period of the study. Each participating pharmacy had to collect all modified prescriptions (cases) during this period.

Selection of cases

All prescriptions for other health care products (such as dressings, incontinence materials, syringes and needles) that were dispensed in the predetermined period to the community pharmacy by the patient were excluded. The data were structured by all prescriptions that were modified by the pharmacy during the study. Reasons for including a prescription modification as a case were defined in the protocol and in the registration form for cases. If there were two or more reasons for modifying a prescription, the pharmacist had to select the one he/she considered most relevant. The protocol excluded the following modifications because of their lack of potential impact on patient care: incorrect or absent address, no or incorrect insurance data, product not in stock. In this study, a prescription error is defined as a result of a prescribing decision or prescription writing process where there is an unintentional significant reduction in the probability of treatment being timely and effective or increase in the risk of harm.

During the data management process the nature of prescription medications were divided into three groups. In the first group a clarification was needed to carry out the prescription order. In most cases, an essential administrative feature of the prescription was missing or obviously incorrect. In fact, the pharmacy could not have dispensed the drug without clarification. In the second group for items identified as `Correction prescription error', the prescription was administratively correct but could potentially have had clinical consequences if not altered. Those identified as `wrong dose' is an important example, for which there are several reasons like too high/low dose according to standard references or in-conflict with the patient's own records. The third group included reasons for medication not covered by the first two categories. Classifications of reported causes of the errors and types of error were adapted from Ashcroft et al., (2005).

All medicines were classified into therapeutic groups using the Anatomical Therapeutic Chemical (ATC) classification of the WHO Collaborating Centre for Drug Statistics Methodology (Anonymous, 1999). After inspection, data from the registration forms were entered in a Microsoft Access database and statistically analyzed

Table 1. Characteristics of the modified prescriptions according to the distribution of ATC classes.

Class	Number (%)
ATC class Blood and blood forming organs	271 (12.2)
ATC class Antiinfectives for systemic use	425 (19.1)
ATC class Nervous system	356 (16.0)
ATC class Cardiovascular system	309 (13.9)
ATC class Musculo-skeletal system	293 (13.2)
Other ATC clases	562 (25.3)

using SPSS 9.0.

All interventions and their outcomes were later reviewed by one member from the research team, who also categorized the intervention as per the Pharmaceutical Care Network of Europe (PCNE) Classifications in Broad Drug Related Problem (DRP) classes (van Mil, 1999). The outcome of the modification (on prescriber or patient level) was recorded as intervention; a) approved and prescription changed, b) approved and no prescript-tion was changed, c) rejected, information only. The community pharmacy anonymised patients and healthcare providers.

RESULTS

A total of 20,205 prescriptions were processed during the study and the overall incidence of modifications by the community pharmacy was 10.9 % (2216 prescriptions). Modifications of prescriptions were most frequently found in the following therapeutic domains: (B) Blood and blood forming organs, (C) Cardiovascular system, (J) Anti-infectives for systemic use, (N) Nervous system, (M) Musculo-skeletal system (Table 1).

Table 2 shows the nature of the prescription modifications. The majority (1676; 75.6%) of the reasons for the medications concerned the clarification of an insufficiently specified prescription (e.g. no specification, insufficient patient data, wrong strength or strength not specified), whereas in 123 cases (5.5%) a prescription error was corrected that might have had clinical consequences (`Correction Prescription Error'). Drug - drug interaction (32.5%), contraindication (6.5%) or double medication (40.6%) were more prevalent in this latter group than other intervention, for example, dose corrections (20.3 %). In Table 3 some individual examples of modifications are presented.

At the prescriber's level, 1,551prescriptions (70%) of all modifications made were accepted and prescription modified. Other outcomes in this category were described as follows: prescriber asked for clarification (5%), prescriber informed only (10%), and intervention not accepted (15%). At the patient level, written information was provided to the patient in over 70% of the modifIcations made, and medication counseling (over and above the routine instructions given at the dispensing window) took place in 20% of all interventions in this category.

DISCUSSION

Our study reports an incidence of 10.9% for prescription modifications at the community pharmacy. This incidence would translate to about 70% pharmacist´ interventions made during the period of the study. Prescribing errors were the most frequent type of error (75.6%), related to clarifications needed to carry out the prescription order. Correction prescription error represented the second prescription modification causes (5.5%). Wrong patient data, double medication, interaction with other medicines, contraindication pregnancy or children, and contraindication allergy were significantly higher (92.4%). The prescribing error incidence is comparable to those reported in other studies (Taylor, 2005). In an Ireland-based study by Sayers et al., (2009) from a total of 3,948 prescriptions, 491 (12.4%) contained one or more errors, and from a total of 8,686 drug items, 546 (6.2%) contained one or more errors. In a UK-based study developed at the primary care Sandars and Esmail (2003) revealed that prescribing and prescription errors occur in up to 11% of all prescriptions, mainly related to errors in dose. In a Taiwan-based study, identified prescription errors in 18.3% (n = 560) of prescriptions at the community setting; potential prescribing errors included errors of omission (25.5%), errors of commission (53.4%), and others (21.1%). The top three errors were incorrect do-sage (27.5%), missing indication (23.6%), and insufficient or unavailable drug information (18.9%) (Ho et al., 2012). Similarly, pharmacist´s intervention is comparable. Hopper et al. (2009) found prescription error in 0.71% of the total 82,800 prescriptions received at the primary health care. The intercepted prescriptions generated 890 drug-related problems (DRPs)-related interventions, and the prescriber accepted intervention in 53% of all interventions, and the treatment was changed accordingly (Hopper et al., 2009). In a Canada-based study by Young et al., (2012) 2.8% of pharmacist´s interventions were reported with the prescriber contacted for 69% of the interventions, seventy-two percent of prescriptions changed and 89% of the problems resolved (Young et al., 2012).

Interventions that were more likely to be accepted by

Table 2. Nature of prescription modifications.

Cause of modification	Number (%) n= 2216
Clarification needed to carry out the prescription order	**1676 (75.6%)**
No or insufficient patient data	358 (21.3)
Confusion of similar names	269 (16.0)
Dose wrong by multiple of 10	227 (13.5)
stated Strength of preparation not	123 (7.3)
Medicine, strength or dosage form not on the market	162 (9.6)
Dose not specified	158 (9.5)
Dosage form not specified	136 (8.1)
Number of tablets, capsules, etc. not specified or incorrect	122 (7.2)
Wrong strength	121 (7.2)
Correction prescription error	**123 (5.5%)**
Wrong patient data	27 (21.9)
Interaction with other medicines	22 (17.8)
Double medication*	22 (21.9)
Wrong dose	18 (14.6)
Contraindication pregnancy or children	13 (10.5)
Contraindication allergy	11 (8.9)
Medicine obsolete	10 (0.8)
Other causes	**417 (18.9%)**
Controlled drug regulations not followed	232 (55.6)
Missing Information about the prescriber	157 (37.6)
Various	28 (6.7)

*double medication is a combination of the same substance or different substances from the same therapeutic group.

Table 3. Some examples of modifications of prescription

Original Prescription	Modified prescription
Ibuprofen (600 mg)	not dispensed because may reduce the diuretic's effectiveness of furosemide (40 mg) prescribed by other doctor
Syrup (Diphenhydramine (5 mg) + chlorpheniramine (0.75 mg) + phenylephrine (5 mg))	not dispensed because dose undetermined in infants
Prednisone (10 mg)	not dispensed because of contraindication in glaucoma
Amoxicillin 250mg/5ml (syrup 60ml)	First prescription of Amoxicillin 250mg/5ml (syrup 60ml) for 7 days (5.5ml/day) instead of Amoxicillin 250/5ml (syrup 120 ml) Amoxicillin changed to ciprofloxacin because of hypersensitivity

the prescribing physicians were those involving dosage errors, duplicate therapy, and questions for patient´s prescribing clarification. We have not attempted to trace the fate of rejected interventions in this study. In the absence of a structured validation process, we were unable to investigate the basis of rejected interventions.

Our findings only refer to actual modifications of the prescriptions presented on the study day as our protocol did not ask for the recording of other potentially relevant interventions such as the modification or discontinuation of an already dispensed drug or an instruction to the patient to avoid certain drug problems.

At the prescriber level similar results were described by Hopper et al. (2009) prescriber asked for clarification (3%). Nature of pharmacist interventions reported are comparable to those described in other studies. In a US-based study by Warholak et al., the most common reason for pharmacists' interventions was to supplement omitted information (31.9%), especially missing directions. Dosing errors were also quite common. The most common response by pharmacists was to contact the prescriber (64.1%) (Warholak et al., 2009). In most cases (56%), the prescription order was changed and the prescription was ultimately dispensed. Other Malaysia-based study reported that 24.2% of the pharmacist' intervention carried out were related to contacting the prescribers and clarifying with the patient or his/her representative (19.4%) (Chua et al., 2003). In this study, at the patient level, the most frequent pharmacist' intervention were providing information to patients about prescribing modifications and medication counseling. Similar findings have been described in recent studies carried out in the US by Kuo et al. (2013) and Carole and Kimberlin (2011).

In fact, our findings are consistent with other studies, related to pharmacist´ intervention and prescribing problems; showing that in a primary care setting, the focus is most often prescription problems (Ekedahl, 2010; Mandt et al., 2009; Leemans et al., 2003). At the same time, to conduct a descriptive study, we have been cautious in comparing these results with other studies, due to varying methodology and definitions of interventions that characterizes these studies (Pottegard et al., 2011). Likewise, from the perspectives of the causes of prescribing errors reported in the scientific literature (Chen et al., 2005b; Lewis et al., 2009; Chen et al., 2005a) two basic considerations could be made. First, despite the computer revolution, much prescription continues to be handwritten and this is a reality in the Spanish health system (Rodríguez-Vera et al., 2002). A number of European countries such as Britain or Spain are still struggling to implement an integrated digitized module (Heise, 2011). Some studies show the association between handwritten prescriptions and the incidence of errors (Al Shahabi et al., 2012; Gandhi et al., 2005; Yuosif, 2011; Tully, 2012). This topic must be taking into consideration in future researches to evaluate the nature of prescription related to prescribing errors at the community pharmacy.

Second, pharmacist-physician communication is a vital component of quality health care. Enhanced communication can reduce costs, promote patient safety, and prevent medical errors (Schenkel, 2000). However, the community pharmacist and the physician play separate roles in the delivery of prescription drugs to patients, a protocol to pharmacist-physician communication, and standardized process to manage the patient´s pharmacotherapy. From our point of view, the outcomes of the study reinforce the importance of prescription screening and interventions by pharmacists in minimizing preventable adverse events attributed to medication errors. At the same time, the impact of the interdisciplinary communication and cooperation in identifying and resolving prescribing errors and irregularities in order to achieve optimal therapeutic outcomes for the patient should be taken into account in future researches.. Professional cooperation between pharmacist and physician should combine the unique knowledge of both professions and thereby achieve optimal drug therapy for the patient (Saanum and Mellbye, 1996).

Conclusion

The findings of this study reinforce the importance of prescription screening and interventions by pharmacists in reducing preventable adverse events attributed to medication errors. It also emphasizes the necessity of interdisciplinary communication and cooperation in identifying and resolving prescribing errors and irregularities in order to achieve optimal therapeutic outcomes for the patient. A systematic and more uniform registration of medication errors in community pharmacy will strengthen the quality of the data and help optimize the possibilities to learn from the described incidents and, hence, improve patient safety.

Conflict of Interests

The author(s) have not declared any conflict of interests.

REFERENCES

Ashcroft DM, Quinlan P, Blenkinsopp A (2005). Prospective study of the incidence, nature and causes of dispensing errors in community pharmacies. Pharmacoepidemiol Drug Saf. 14(5):327-32.

Al Shahaibi NM, Al Said LS, Kini TG, Chitme HR (2012). Identifying errors in handwritten outpatient prescriptions in Oman. J. Young. Pharm. 4:267-72.

Anonymous (1999). ATC Index with DDDs. Oslo: WHO Collaborating Centre for Drug Statistics Methodology. www.whocc.no/atc/structure_and_principles/.

Bosch X (2000). New role proposed for Spanish pharmacists. Lancet 356(9223):53.

Carole L, Kimberlin A (2011). Patient counseling practices in U.S. pharmacies: Effects of having pharmacists hand the medication to the patient and state regulations on pharmacist counseling. J. Am. Pharm. Assoc. 51:527-534.

Chen YF, Neil KE, Avery AJ, Dewey ME, Johnson C (2005). Prescribing errors and other problems reported by community pharmacists. Ther. Clin. Risk Manag. 1(4):333–342.

Chen YF, Avery AJ, Neil KE, Johnson C, Dewey ME, Stockley IH (2005). Incidence and possible causes of prescribing potentially hazardous/contraindicated drug combinations in general practice. Drug Saf. 28(1):67-80

Chua S, Kuan M, Mohamed N (2003). Research article Outpatient Prescription Intervention Activities by Pharmacists in a Teaching Hospital Malays. J. Pharm. 1(3):86-90.

Ekedahl A (2010). Problem prescriptions in Sweden necessitating contact with the prescriber before dispensing. Res. Social. Adm. Pharm. 6(3):174–84.

Gandhi TK, Weingart SN, Seger AC, Borus J, Burdick E, Poon EG, Leape LL, Bates DW (2005). Outpatient prescribing errors and the impact of computerized prescribing. J. Gen. Intern. Med. 20(9):837-41.

Giampaolo P, Pietro M (2009). Medication errors: prescribing faults and prescription errors. Br. J. Clin. Pharmacol. 67(6):624–628.)

Grindrod KA, Patel P, Martin JE (2006). What interventions should pharmacists employ to impact health practitioners' prescribing practices? Ann. Pharmacother. 40(9):1546-57.

Grissinger M, Globus N, Fricker M (2003). The Role of Managed Care Pharmacy in Reducing Medication Errors. J. Managed Care Pharm. 9(1):62-65.

Hammerlein A, Schulz M, Diniz RS (2011). Survey of drug-related problems identified by community pharmacies. Lat. Am. J. Pharm. 30(6):1098-1103.

Heise J (2011). E-prescribing around the world. International Trends. Keeping in touch with developments in e-prescribing around the globe. www.samedobreapteki.pl/upload/2rp_nov09_pg28.pdf.

Ho YF, Hsieh LL, Lu WC, Hu FC, Hale KM, Lee SJ, Lin FJ (2012). Appropriateness of ambulatory prescriptions in Taiwan: translating claims data into initiatives. Int. J. Clin. Pharm. 34(1):72-80.

Hooper R, Adam A, Kheir N (2009). Pharmacist-documented interventions during the dispensing process in a primary health care facility in Qatar. Drug Healthc. Patient Saf. 1:73-80.

Institute of Medicine. Preventing Medication Errors (IOM) (2007). Washington DC: The National Academies Press.

Kuo GM, Touchette DR, Marinac JS (2013). Drug Errors and Related Interventions Reported by United States Clinical Pharmacists: The American College of Clinical Pharmacy Practice-Based Research Network Medication Error Detection, Amelioration and Prevention Study. Pharmacotherapy 33(3):253-65.

Leemans L, Veroeveren L, Bulens J (2003). Frequency and trends of interventions of prescriptions in Flemish community pharmacies. Pharm. World. Sci. 25(2):65–9.

Lewis PJ, Dornan T, Taylor D, Tully MP, Wass V, Ashcroft DM (2009). Prevalence, Incidence and Nature of Prescribing Errors in Hospital Inpatients: A Systematic Review. Drug Saf. 32(5):379-89.

Mandt I, Horn AM, Granas AG (2009). Communication about prescription interventions between pharmacists and general practitioners. Tidsskr Nor Laegeforen. 129(18):1846–9.

Martínez-Sánchez A (2012). Medication errors in a Spanish community pharmacy: nature, frequency and potential causes. Int. J. Clin. Pharm. Dec 19. [Epub ahead of print]. doi 10.1007/s11096-012-9741-0.

Pottegård A, Hallas J, Søndergaard J (2011). Pharmaceutical interventions on prescription problems in a Danish pharmacy setting. Int. J. Clin. Pharm. 33:1019-1027.

Rigby D (2010). Collaboration between doctors and pharmacists in the community. Austr. Prescr. 33:191–3.

Rodríguez-Vera F, Marín Y, Sánchez A (2002). Illegible handwriting in medical records. J. R. Soc Med. 95(11): 545–546.

Ross S, Ryan C, Duncan EM, Francis JJ (2012). Perceived causes of prescribing errors by junior doctors in hospital inpatients: a study from the PROTECT programme. BMJ Qual. Saf. 22(2):97-102.

Saanum DT, Mellbye KS (1996). The prescription as an aid for communication between physicians and pharmacists. A study of errors and insufficient information on prescriptions. Tidsskr Nor Laegeforen 116(19):2325-9.

Sandars J, Esmail A (2003). The frequency and nature of medical error in primary care: understanding the diversity across studies. Fam. Pract. 20(3):231-236.

Sayers YM, Armstrong P, Hanley K (2009). Prescribing errors in general practice: a prospective study. Eur. J. Gen. Pract. 15(2):81–83.

Schenkel S (2000). Promoting patient safety and preventing medical error in emergency departments. Acad. Emerg. Med. 7:1204-22.

Taylor LK, Kawasumi Y, Bartlett G (2005). Inappropriate Prescribing Practices: The Challenge and Opportunity for Patient Safety. Healthc Q. 8 Spec No: 81-5.

Tully MP (2012). Prescribing errors in hospital practice. Br. J. Clin. Pharmacol. 74(4):668-75.

van Mil JWF (1999). Proceedings of the International Working Conference on Outcomes Measurements in Pharmaceutical Care. Pharm. Care Netw. Eur. 84:26-29.

Warholak M, Rupp T (2009). Analysis of community chain pharmacists' interventions on electronic prescriptions. J. Am. Pharm. Assoc. 49:59-64.

Chen YF (2005). Prescribing errors and other problems reported by community pharmacists. Ther. Clin. Risk. Manag. 1(4):333–342.

Young SW, Bishop LD, Conway A (2012). Interventions performed by community pharmacists in one Canadian province: a cross-sectional study. Ther Clin. Risk Manag. 8:415-21.

Yousif MA1, Nizar S, Elmustafa MO, Mustafa MI, Bella MM (2011). Investigation of medication prescribing errors in Wad Medani, Gezira, Sudan. Int. J. Risk. Saf. Med. 23(1):11-6.