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Assessment of Prescription Errors among Community Pharmacists in Quetta Balochitsan, Pakistan

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Abstract

Background: Community pharmacists can serve as a key source of scientifically correct drug information and can provide advice on how to utilise pharmaceuticals in a safe, appropriate, and cost–effective manner. The dispensing procedure at a community pharmacy is an important aspect of safe medication usage, and it is one of a pharmacist's primary professional tasks, along with patient counselling. **Objectives:** To find awareness level of community pharmacist regarding prescription error and to find either they can find prescription errors or not. **Methods:** A cross sectional descriptive study was conducted in community pharmacies of Balochistan, Quetta by using simulated prescriptions containing identifiable errors in Quetta Pakistan. Analyses was performed on IBM SPSS. **Results:** As per qualifications the maximum 259 (92.8%) were Pharm-D degree holder. As far s experience is concerned most of them 197 (70.6%) had 1-3 years of experience. In all prescriptions Level of Errors Identification on individual Medicine. The result it was found that non identified errors were dominant in all prescription. Only the experience group was statistically significant ($p<0.001$). and rest of variables were non-significant ($p>0.05$). **Conclusion:** Understanding the types of prescription mistakes and the variables that contribute to them allows for error avoidance at the earliest stage of the pharmaceutical process. Preparing pharmacy, medical, and nursing students to recognise prescription mistakes enhances patient care and reduces the risk of negative outcomes.

Keywords: Prescription error, Community pharmacist, Pakistan.

INTRODUCTION

Today's community pharmacists are involved in various of professional tasks, including drug therapy optimization and promotion of health, wellness, and disease prevention.[1] Community pharmacists can serve as a key source of scientifically correct drug information and can provide advice on how to utilise pharmaceuticals in a safe, appropriate, and cost–effective manner. The dispensing procedure at a community pharmacy is an important aspect of safe medication usage, and it is one of a pharmacist's primary professional tasks, along with patient counselling.[1-2]

The "five rights" idea has been used to explain the processes that contribute to safe pharmaceutical use: the right dose of the right drug given to the right patient at the right time and route. This idea, however, is oversimplified, since there are other stages to safe medicine usage that should be addressed, steps that are depending on the environment in which the drug-related activity is taking place. Different numbers and types of "rights" may exist at different parts of the medicine usage process.[3] Prescriptions are frequently screened by community pharmacists for any issues, such as prescribing mistakes, before they are distributed. They are in a unique position to detect, document, correct, and prevent prescription mistakes.[4]

Prescriptions for drugs are an important aspect of medical care. It entails making decisions about which medicines to take, communicating those decisions to pharmacists in the form of prescriptions for dispensing, and lastly administering drugs.[5] At each phase, there is a decreasing knowledge gap, with patients being the least educated and nearly completely uninformed of the advantages and hazards of drugs. This procedure, like any other involving several persons, is susceptible to mistakes that might jeopardise patient care. Health care providers are paying close attention to ensuring that patients receive the proper medicine on time.[6]

Understanding and recording the types, causes, and frequency of dispensing mistakes that occur locally, as well as corrective activities taken to prevent such errors, is critical. The research on dispensing mistakes and their potentially hazardous consequences is extensive.[7-8] In recent years, there has been a surge in interest in the role of automation and computerization in minimising dispensing mistakes and their consequences for patients.[9]

Patients may experience disproportionate distress and suffering as a result of dispensing mistakes. High pharmacist workload, brands/drugs with phonetic resemblance, interruptions and diversions in the distribution procedure, and difficulty to read doctor's handwriting are all variables that contribute

to dispensing mistakes.[2] A dispensing mistake is described as a discrepancy between the prescriptions prescribed and the medications given to the patient. Dispensing medication with ineffective medicinal results is one example of a mistake. Dispensing mistakes include, but are not limited to, giving the wrong medicine, giving the wrong dosage strength and frequency, and giving the wrong drug to the wrong patient.[10]

Medication mistakes may have far-reaching, terrible implications that affect more than just patients and their families. Drug mistakes can impact prescribing physicians, nurses who give the medication, and pharmacists who fill and evaluate prescription orders. Prescription mistakes cause many drug errors, which have a higher risk of catastrophic effects.[11] According to one study, the majority of prescribing errors are due to a lack of patient information, specific drug therapy (e.g., narrow therapeutic index medications), or an inability to incorporate patient-specific factors (e.g., declining renal function) into appropriate drug therapy selection and dosing. Miscalculations, incorrect decimal point use, unit or rate expressions, and nomenclature all contribute to other problems.[12]

Despite the fact that prescription mistakes have been extensively researched, the majority of studies have focused on the kinds, causes, and prevention of errors in hospital and outpatient practise settings, with patient groups ranging from juvenile to geriatric.[13] To our knowledge, no research has looked at pharmacist's capacity to detect prescription mistakes. Information on health professional students' understanding of prescribing mistakes might be used to design educational aids for health care professionals in the future.

METHODS

Objectives

The aim of this study was to find awareness level of community of pharmacist regarding errors identification in dummy prescriptions.

Study Design and Settings and Population

A cross sectional descriptive study was conducted in community pharmacies of Balochistan, Quetta. Community pharmacist in different healthcare facilities in Quetta.

Study Tool

The study tool comprised of Demographics and dummy prescription containing identifiable errors.

Sampling Procedure

Convenient sampling technique was used.

Inclusion Criteria

- Community Pharmacist
- Hospital Pharmacist

Exclusion Criteria

Pharmacy Students

Other Medical Professionals

Ethical Consideration

The study was conducted according to the ethical guidelines for human experimentation. According to the National Bioethical Committee of Pakistan, surveys which do not involve administration of any medicinal substance should be approved by the institutional heads (National Bioethics Committee Pakistan, 2011). The Study was approved by the departmental research committee of the Department of Pharmacy Practice, Faculty of Pharmacy and Health Sciences, University of Balochistan, Quetta, in addition the approval from the Director of the respective hospital was also taken.

Data Analysis

The data were computed and analysed using IBM statistical package for health sciences version 23 (IBM SPSS version 23). Descriptive analysis and Inferential statistics were applied. The results for categorical variables were reported, as frequencies and percentages. Non-Parametric analysis (Chi sqaure test, $p < 0.05$) were used to assess the significance among study variables.

RESULTS

Demographic Characteristics

Table 1 showed demographic characteristics. Most of the respondents 183 (65.6%) were male. Majority of participants 220 (78.9%) belong to 21-30 years. As per qualifications the maximum 259 (92.8%) were Pharm-D degree holder. As far s experience is concerned most of them 197 (70.6%) had 1-3 years of experience.

IDENTIFICATIONS

Error Identifications in Prescription 1.

Table 2.1 showed about Error Identifications in prescription 1. Most of pharmacist 66.3% were agreed that prescription 1 had errors and the rate of error identification was incorrect 72.4% in maximum pharmacist.

Table 1: Demographic Characteristics.

Demographics		Frequency	Percentage
Gender	Male Female	183 96	65.6 34.4
Age	21-30 31-40	220 59	78.9 21.1
Qualification	Pharm-D M Phill	259 20	92.8 7.2
Experience	1-3 4-6 7-9 10-12	197 51 21 10	70.6 18.3 7.5 3.6

Table 2.1: Error Identifications in prescription 1.

Error Identifications in prescription		Frequency	Percentage
Do you find any error in prescription?	**Yes** **No**	185 94	66.3 33.7
In how many prescriptions you find error?	**Correctly found** **Incorrectly found**	77 202	27.6 72.4

Prescription 1. Level Errors Identification on individual Medicine

Table 2.2 showed about Prescription 1. Level of Errors Identification on individual Medicine. The result showed that non identified errors were dominant in all three medicine of prescription 1.

Prescription 1. Details of Errors

Table 2.3 showed about Prescription 1. Details of errors. The result showed about details of individual medicine related error.

Error Identifications in prescription 2.

Table 3.1 showed about Error Identifications in prescription 2. Most of pharmacist 50.9% were agreed that prescription two had errors and the rate of error identification was was incorrect 86.0% in maximum pharmacist.

Prescription 2. Level Errors Identification

Table 3.2 showed about Prescription 2. Level of Errors Identification on individual Medicine. The result showed that non identified errors were dominant in all three medicine of prescription 2.

Table 2.3: Prescription 1. Details of Errors.

Errors		Drug 1 (Tab. Motilium 10mg)	Drug 2 (Cap. Risek20mg)	Drug 3 (Syp. Dijex MP)
Wrong Drug	Yes No	35 (12.5%) 244 (87.5%)	5 (1.8%) 274 (98.2%)	20 (7.2%) 259 (92.8%)
Wrong Dose	Yes No	68 (24.4%) 211 (75.6%)	68 (24.4%) 211 (75.6%)	10 (3.6%) 269 (96.4%)
Wong Dosage From	Yes No	20 (7.2%) 259 (92.8%)	47 (16.8%) 232 (83.2%)	5 (1.8%) 274 (98.2%)
Wrong Frequency	Yes No	54 (19.4%) 225 (80.6%)	18 (6.5%) 261 (93.5%)	10 (3.6%) 269 (96.4%)
Wrong direction for use	Yes No	29 (10.4%) 250 (89.6%)	38 (13.6%) 241 (86.4%)	5 (1.8%) 274 (98.2%)
Wrong Duration of Therapy	Yes No	30 (10.8%) 249 (89.3%)	0 (0.0%) 100 (100.0%)	9 (3.2%) 270 (96.8%)

Table 3.1: Error Identifications in prescription 2.

Error Identifications		Frequency	Percentage
Do you find any error in prescription?	Yes No	142 137	50.9 49.1
In how many prescriptions you find error?	Correctly found Incorrectly found	39 240	14.0 86.0

Table 3.2: Prescription 2. Level Errors Identification on individual Medicine.

Drugs	Errors	
	Identified	Not Identified
Ventolin Inhaler	9 (3.2%)	270 (96.8%)
DPIC-Combiviar 400	19 (6.8%)	260 (93.2%)
Rotahaler	24 (8.6%)	255 (91.4%)
Tab. Montika 10mg		

Table 3.3: Prescription 2. Details of Errors.

Errors		Drug 1 (Ventolin Inhaler)	Drug 2 (DPIC-Combiviar 400)	Drug 3 (Rotahaler)
Wrong Drug	Yes No	19 (6.8%) 269 (93.2%)	25 (9.0%) 254 (91.0%)	19 (6.8%) 260 (93.2%)
Wrong Dose	Yes No	45 (16.1%) 234 (83.9%)	33 (11.8%) 246 (88.2%)	40 (14.3%) 239 (85.7%)
Wong Dosage From	Yes No	15 (5.4%) 264 (94.6%)	25 (9.0%) 254 (91.0%)	5 (1.8%) 274 (98.2%)
Wrong Frequency	Yes No	15 (5.4%) 264 (94.6%)	19 (6.8%) 260 (93.2%)	24 (8.6%) 255 (91.4%)
Wrong direction for use	Yes No	35 (12.5%) 244 (87.5%)	5 (1.8%) 274 (98.2%)	5 (1.8%) 274 (98.2%)
Wrong Duration of Therapy	Yes No	0 (0.0%) 279 (100.0%)	4 (1.4%) 275 (98.6%)	15 (5.4%) 264 (94.6%)

Table 4.1: Error Identifications in prescription 3.

Error Identifications		Frequency	Percentage
Do you find any error in prescription?	Yes No	102 177	36.6 63.4
In how many prescriptions you find error?	Correctly found Incorrectly found	28 251	10.0 90.0

Table 4.2: Prescription 3. Level Errors Identification on individual Medicine.

Drugs	Errors	
	Identified	Not Identified
Tab. Ruvastat 10mg	18 (6.5%)	261 (93.5%)
Tab. Extor 5mg/80mg	13 (4.7%)	266 (95.3%)
Tab. Loprine 75mg	23 (8.2%)	256 (91.8%)

Prescription 2. Details of Errors

Table 3.3 showed about Prescription 2. Details of errors. The result showed about details of individual medicine related error.

Error Identifications in prescription 3.

Table 4.1 showed about Error Identifications in prescription 3. Most of pharmacist 63.4% were agreed that prescription three had errors and the rate of error identification was was incorrect 90.0% in maximum pharmacist.

Prescription 3. Level Errors Identification

Table 4.2 showed about Prescription 3. Level of Errors Identification on individual Medicine. The result showed that non identified errors were dominant in all three medicine of prescription 3.

Prescription 3. Details of Errors

Table 4.3 showed about Prescription 3. Details of errors. The result showed about details of individual medicine related error.

Table 4.3: Prescription Details of Errors.

Errors		Drug 1 (Tab. Ruvastat 10mg)	Drug 2 (Tab. Extor 5/80mg))	Drug 3 (Loprin 75mg)
Wrong Drug	Yes No	30 (10.8%) 249 (89.2%)	15 (5.4%) 264 (94.6%)	20 259
Wrong Dose	Yes No	34 (12.25%) 245 (87.8%)	19 (6.8%) 260 (93.2%)	15 (5.4%) 264 (94.6%)
Wong Dosage From	Yes No	10 (3.6%) 269 (96.4%)	10 (3.6%) 269 (96.4%)	0 (0.00%) 279 (100.0%)
Wrong Frequency	Yes No	30 (10.8%) 249 (89.2%)	14 (5.0%) 265 (95.0%)	14 (5.0%) 265 (95.0%)
Wrong direction for use	Yes No	10 (3.6%) 269 (96.4%)	05 (1.2%) 274 (98.2%)	0 (0.00%) 279 (100.0%)
Wrong Duration of Therapy	Yes No	30 (10.8%) 249 (89.2%)	05 (1.2%) 274 (98.2%)	05 (1.2%) 274 (98.2%)

Table 5.1: Error Identifications in prescription 4.

Error Identifications		Frequency	Percentage
Do you find any error in prescription?	Yes No	232 47	83.2 16.8
In how many prescriptions you find error?	Correctly found Incorrectly found	101 178	36.2 63.8

Table 5.2. Prescription 4 Level Errors Identification.

Drugs	Errors	
	Identified	Not Identified
Tab. Ciprofloxacin 500mg	92 (33.0%)	187 (67.0%)
Citro Soda	92 (33.0%)	187 (67.0%)
Tab. Panadol	82 (29.4%)	197 (70.65%)
Tab. Avelox	102 (36.6%)	177 (63.4%)

Error Identifications in prescription 4.

Table 5.1 showed about Error Identifications in prescription 4. Most of pharmacist 83.2% were agreed that prescription four had errors and the rate of error identification was was incorrect 63.8% in maximum pharmacist.

Prescription 4. Level Errors Identification

Table 5.2 showed about Prescription 4. Level of Errors Identification on individual Medicine. The result showed that non identified errors were dominant in all three medicine of prescription 4.

Prescription 4. Details of Errors

Table 5.3 showed about Prescription 4. Details of errors. The result showed about details of individual medicine related error.

Identifications in prescription 4.

Table 6.1 showed about Error Identifications in prescription 5. Most of pharmacist 50.5% were agreed that prescription five had errors and the rate of error identification was was incorrect 77.8% in maximum pharmacist.

Table 5.3: Prescription 4 Level Errors Identification.

Errors		Tab. Ciprofloxacin 500mg	Citro Soda	Tab. Panadol	Tab. Avelox
Wrong Drug	**Yes** **No**	29 (10.4%) 250 (89.6%)	0 (0.00%) 279 (100.0%)	30 (10.8%) 249 (89.2%)	122 (43.7%) 157 (56.3%)
Wrong Dose	**Yes** **No**	87 (31.2%) 192 (68.8%)	0 (0.00%) 279 (100.0%)	39 (14.0%) 240 (86.0%)	30 (10.8%) 249 (89.2%)
Wong Dosage From	**Yes** **No**	9 (3.2%) 270 (96.8%)	5 (1.8%) 274 (98.2%)	5 (1.8%) 274 (98.2%)	10 (0.00%) 269 (100.0%)
Wrong Frequency	**Yes** **No**	39 (14.0%) 240 (86.0%)	9 (3.2%) 270 (96.8%)	20 (7.2%) 259 (92.8%)	20 (7.2%) 259 (92.8%)
Wrong direction for use	**Yes** **No**	5 (1.8%) 274 (98.2%)	5 (1.8%) 274 (98.2%)	10 (0.00%) 269 (100.0%)	15 (5.4%) 264 (94.6%)
Wrong Duration of Therapy	**Yes** **No**	0 (0.00%) 279 (100.0%)	0 (0.00%) 279 (100.0%)	9 (3.2%) 270 (96.8%)	5 (1.8%) 274 (98.2%)

Table 6.1: Error Identifications in prescription 5.

Error Identifications		Frequency	Percentage
Do you find any error in prescription?	Yes No	141 138	50.5 49.5
In how many prescriptions you find error?	Correctly found Incorrectly found	62 217	22.2 77.8

Table 6.2: Prescription 5. Level Errors Identification.

Drugs	Errors	
	Identified	Not Identified
Inj. Leflox 750mg	62 (22.2%)	217 (77.8%)
Tab. Panadol	57 (20.4%)	222 (79.6)
Brufen 400mg	72 (25.8%)	207 (74.2%)

Table 6.3: Prescription 5. Details of Errors.

Errors		Inj. Leflox 750mg	Tab. Panadol	Brufen 400mg
Wrong Drug	**Yes** **No**	10 (0.00%) 269 (100.0%)	18 (6.5%) 261(93.5%)	10 (0.00%) 269 (100.0%)
Wrong Dose	**Yes** **No**	10 (0.00%) 241 (100.0%)	65 (23.3%) 214 (76.6%)	25 (9.0%) 254 (91.0%)
Wong Dosage From	**Yes** **No**	33 (11.8%) 246 (88.2%)	4 (1.4%) 275 (98.6%)	10 (0.00%) 269 (100.0%)
Wrong Frequency	**Yes** **No**	10 (0.00%) 269 (100.0%)	34 (11.8%) 245 (88.2%)	5 (1.8%) 274 (98.2%)
Wrong direction for use	Yes **No**	5 (1.8%) 274 (98.2%)	5 (1.8%) 274 (98.2%)	10 (0.00%) 269 (100.0%)
Wrong Duration of Therapy	**Yes** **No**	5 (1.8%) 274 (98.2%)	20 (7.2%) 259 (92.8%)	20 (7.2%) 259 (92.8%)

Prescription 5. Level Errors Identification

Table 6.2 showed about Prescription 5. Level of Errors Identification on individual Medicine. The result showed that non identified errors were dominant in all three medicine of prescription 5.

Table 7: Chi square test of significance.

Demographics		Errors Identification		*P* value
		Correct Identification	Incorrect Identification	
Gender	Male Female	29 10	154 86	0.214
Age	21-30 31-40	29 10	191 49	0.459
Qualification	Pharm-D M Phill	34 5	225 15	0.140
Experience	1-3 4-6 7-9 10-12	24 10 0 5	173 41 21 5	0.001

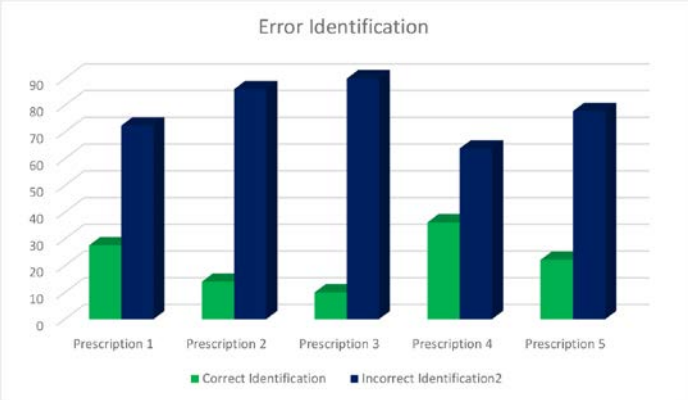

Figure 1: Errors Identifications.

Prescription 5. Details of Errors

Table 6.3 showed about Prescription 5. Details of errors. The result showed about details of individual medicine related error.

Chi square test of significance

A chi square test of significance was performed as sown in Table 7. Only the experience group was statistically significant ($p<0.001$). and rest of variables were non-significant ($p>0.05$).

Figure 1 shows error identification of drugs in prescription. majority of participants resulted in incorrect identification in all prescriptions.

DISCUSSION

To our knowledge, no research has looked at the capacity of pharmacist to recognise prescription mistakes. This is the only simulation research that we are aware of that compares differences between individual pharmacists analysing the identical medication prescriptions at community pharmacy. However, several approaches have been used to investigate the percentages of agreement among community pharmacists. Krska *et al.* looked at the suggestions of 60 community pharmacists who had reviewed 738 medication prescriptions for coronary heart disease patients.[14] Another study founded that pharmacy students accurately recognised more prescription mistakes than medical and nursing students in this study, which is unsurprising given that pharmacy students take more drug-related courses than medical or nursing students.[15]

Two reviewers looked over these prescriptions as well. Only 33.8 percent of the reviewers' suggestions were likewise provided by community pharmacists. Laaksonen *et al.* looked at how community pharmacists performed after obtaining specialised training. After that, one clinical pharmacist and 26 community pharmacists were instructed to look for drug-related problems (DRPs) in 461 patients' prescriptions; the community pharmacists recognised 75% of the DRPs found by the clinical pharmacist.[16] An increase in medicine also increased the chance of medication mistakes. As a result, adequate drug treatment regulation and evidence-based clinical standards are critical for minimising an undue burden on patient economy and health by prescribing the smallest number of therapeutically required drugs.[17]

The findings of current study showed that lack of knowledge was prevailed among community pharmacist of Balochistan. Incorrect errors identification was prevailed in current study. The findings were also comparable with other study finding which explained in order to identify system problems that prevent community pharmacy dispensing errors and decrease patient harm, evidence of the rates and causes of dispensing errors must be generated. While some studies have outlined evidence of medication errors in community settings.[18] The findings of current study in terms of wrong identification error which leads to drug related problems were consistent with overall rate of medication errors was 6.7%, which included 2.6% and 4.1%. Although a formal statistical comparison was not possible, our results showed a higher dispensing error rate compared to other studies conducted in community pharmacies in the UK 3%, USA 1.7%, and Denmark 1/10000.[19]

The current study showed that significant association was seen with Experience group of community pharmacist. This was comparable with another study finding there were statistical differences in age, years of education, medical-related job experience, and having achieved a bachelor's degree across the study groups, these discrepancies may reflect the prerequisites of each programme.[11]

CONCLUSION

Understanding the types of prescription mistakes and the variables that contribute to them allows for error avoidance at the earliest stage of the pharmaceutical process. Preparing pharmacy, medical, and nursing students to recognise prescription mistakes enhances patient care and reduces the risk of negative outcomes. Clinical experiences or clerkships are often the first chance for these students to see medication therapy beginning and engage in the prevention and detection of prescription mistakes. Early training focusing on medication mistake prevention, particularly in the educational context, may help to reduce future medication errors in the patient care setting. There are differences in pharmacists' performance, just as there are in the performance of other health care providers. Individual performance might be improved by pharmacist training, standardisation of pharmaceutical analysis of medication prescriptions, and development of a clinical decision support system that allows biological parameters to be connected to drug prescriptions.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

1. American College of Clinical Pharmacy. The definition of clinical pharmacy. Pharmacotherapy. 2008;28(6):816-7. doi: 10.1592/phco.28.6.816, PMID 18503408.
2. Peterson GM, Wu MS, Bergin JK. Pharmacist's attitudes towards dispensing errors: Their causes and prevention. J Clin Pharm Ther. 1999;24(1):57-71. doi: 10.1046/j.1365-2710.1999.00199.x, PMID 10319909.
3. Grissinger M. The five rights: A destination without a map. Pharm Ther. 2010;35(10):542.

4. Tariq RA, *et al*. Medication dispensing errors and prevention; 2018.
5. Mohan P, Sharma AK, Panwar SS. Identification and quantification of prescription errors. Med J Armed Forces India. 2014;70(2):149-53. doi: 10.1016/j.mjafi.2014.01.002, PMID 24843204.
6. Riaz MK, Hashmi FK, Bukhari NI, Riaz M, Hussain K. Occurrence of medication errors and comparison of manual and computerized prescription systems in public sector hospitals in Lahore, Pakistan. PLOS ONE. 2014;9(8):e106080. doi: 10.1371/journal.pone.0106080, PMID 25165851.
7. Chapuis C, Roustit M, Bal G, Schwebel C, Pansu P, David-Tchouda S, *et al*. Automated drug dispensing system reduces medication errors in an intensive care setting. Crit Care Med. 2010;38(12):2275-81. doi: 10.1097/CCM.0b013e3181f8569b, PMID 20838333.
8. Anacleto TA, Perini E, Rosa MB, César CC. Medication errors and drug-dispensing systems in a hospital pharmacy. Clinics (Sao Paulo). 2005;60(4):325-32. doi: 10.1590/s1807-59322005000400011, PMID 16138240.
9. Radley DC, Wasserman MR, Olsho LE, Shoemaker SJ, Spranca MD, Bradshaw B. Reduction in medication errors in hospitals due to adoption of computerized provider order entry systems. J Am Med Inform Assoc. 2013;20(3):470-6. doi: 10.1136/amiajnl-2012-001241, PMID 23425440.
10. Cheung KC, Bouvy ML, De Smet PA. Medication errors: The importance of safe dispensing. Br J Clin Pharmacol. 2009;67(6):676-80. doi: 10.1111/j.1365-2125.2009.03428.x, PMID 19594537.
11. Warholak TL, Queiruga C, Roush R, Phan H. Medication error identification rates by pharmacy, medical, and nursing students. Am J Pharm Educ. 2011;75(2):24. doi: 10.5688/ajpe75224, PMID 21519414.
12. Lesar TS, Briceland LL, Delcoure K, Parmalee JC, Masta-Gornic V, Pohl H. Medication prescribing errors in a teaching hospital. JAMA. 1990;263(17):2329-34, PMID 2325234.
13. Kozer EK, Scolnik D, Macpherson A, Rauchwerger D, Koren G. The effect of a short tutorial on the incidence of prescribing errors in pediatric emergency care. Can J Clin Pharmacol. 2006;13(3):e285-91. PMID 17085777.
14. Krska J, Avery AJ, CPMMPE. Evaluation of medication reviews conducted by community pharmacists: A quantitative analysis of documented issues and recommendations. Br J Clin Pharmacol. 2008;65(3):386-96. doi: 10.1111/j.1365-2125.2007.03022.x, PMID 17922887.
15. Simonsen BO, Daehlin GK, Johansson I, Farup PG. Differences in medication knowledge and risk of errors between graduating nursing students and working registered nurses: Comparative study. BMC Health Serv Res. 2014;14(1):580. doi: 10.1186/s12913-014-0580-7, PMID 25413244.
16. Laaksonen R, Duggan C, Bates I. Performance of community pharmacists in providing clinical medication reviews. Ann Pharmacother. 2010;44(7-8):1181-90. doi: 10.1345/aph.1M719, PMID 20571102.
17. Sheikh D, Mateti UV, Kabekkodu S, Sanal T. Assessment of medication errors and adherence to WHO prescription writing guidelines in a tertiary care hospital. Future J Pharm Sci. 2017;3(1):60-4. doi: 10.1016/j.fjps.2017.03.001.
18. James KL, Barlow D, McArtney R, Hiom S, Roberts D, Whittlesea C. Incidence, type and causes of dispensing errors: A review of the literature. Int J Pharm Pract. 2009;17(1):9-30. doi: 10.1211/ijpp.17.1.0004, PMID 20218026.
19. Knudsen P, Herborg H, Mortensen AR, Knudsen M, Hellebek A. Preventing medication errors in community pharmacy: Frequency and seriousness of medication errors. Qual Saf Health Care. 2007;16(4):291-6. doi: 10.1136/qshc.2006.018770, PMID 17693678.