Influential Factors on Pharmacist Profession- Related Errors: a Community Pharmacy Approach

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Abstract

Community pharmacy is one of the most important control stations in pharmacotherapy. Hence, Pharmacist mistakes may cause or lead to inappropriate medication use by patients or even permanent harm. Therefore, quality control in pharmacists' practice is a safety issue and in addition has an added importance for society. This study has been designed to investigate the relationship between age, gender, shift work of pharmacists and the frequency of errors to determine possible defect and planning for them. Job descriptive and analysis were done using Hierarchical Task Analysis (HTA). The study population was observed directly and all the defined mistakes were recorded. The collected data were analyzed using regression and two-sided, chi-square analysis. The pharmacists supervised for 64 determinate mistakes and 3968 mistakes were recorded with a rate 36.7%. Based on the results, occurrence of mistakes are associated with shift work, age, and gender of pharmacists. There are significant increases in incidence of occupational errors in afternoon and night shifts, male population, over 40 years' old population and long shift. Considering the relationship between pharmacist profession-related error and shift conditions or some of the demographic factors, it seems that further systematic evaluation on community pharmacy administration is necessary.

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1. Introduction

Medication errors are a worldwide challenges threatening community health. The adverse effects of medication errors not only impose costs on whole society, but also could threaten patient safety. Although less than 1% of all medication errors terminate to significant problem, up to 6.7% have potential risk of

adverse medicine events [1]. According to the National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) definition in summary, "A medication error is any preventable event that may cause or lead to inappropriate medication use or patient harm" [2]. Medication errors may occur in any stages of pharmacotherapy including ordering, transcription, dispensing, education, administration, discharge summaries and monitoring [1]. From the patient perspective, pharmacy is the final control station of pharmacotherapy. Previous studies have shown the lowest rate of incidence (range of 1.0% to 2.9%) for pharmacy-dispensing errors [3]. But since pharmacist mistakes are associated with medication errors and the adverse medicine events following them are hard to prevent, the quality control of pharmacists practice has a great effect on society health. Unfortunately some complexities are associated with medication errors tracing. Some of them do not lead to adverse drug events; some adverse drugs events do not reported by patients or are too mild to hospitalization. On the other hand, due to the fact that hospitalized patients are often critically ill, some medications errors cannot be taken lightly. Therefore, retrospective studies underestimate the prevalence of medication errors. This study was designed with approach to preventing medication error by focusing on occupational activities of pharmacist. To achieve this goal all occupational performance tasks of pharmacist were considered and the relationship between age, gender, shift work of pharmacists and the

frequency of mistakes were analyzed. This study was carried out in Tehran, capital of Iran and the biggest metropolis in this country (population around 9 million) [4, 5]. Most of the major and referral hospitals or medical centers of Iran are located in Tehran and many of the complicated patients are referred to them from across the country. Therefore, the quality of health care in Tehran has a great impact on population health.

2. Methods

2.1. Setting and Study Design

The study was conducted in Tehran and was designed as a cross-sectional descriptive survey of pharmacists' mistakes in occupational activities, during 2016. The main tools used for study was blind direct observation. The study population included pharmacists from north, south, east and west of Tehran and in morning, afternoon and night shift works that were selected randomly.

2.2. Job Analysis and Checklist Codification

Job descriptive and analysis were done using Hierarchical Task Analysis (HTA) method. HTA is a transformative tool to identify and understand the tasks of practitioners need to achieve certain goals [6]. According to the qualitative approach of this stage, 10 pharmacies were selected and all of the activities carried out by them were recorded. The results of the observation phase were confirmed by an expert panel. Then the Iran Pharmacists Association list of tasks was combined with data from the observation phase in a HTA template. The pertaining error

probability to each sub-tasks was discussed by advisory expert team and scored from zero (the least probable) to ten (the most probable). The sub-tasks with the score above 5 were chosen for study.

2.3. Pharmacists Profession- Related Errors Detection

Data are collected through direct observation in community pharmacies, whereas the pharmacist was unaware of the supervision. In this way both occurrence and nonoccurrence of each error were recorded for all tasks in prepared checklist by a researcher pharmacist.

2.4. Statistical Analyses

To evaluate the relationship between occurrence of errors and some of the demographic variables including (age, gender, shift work and duration of shift), regression model and two-sided, chi-square analysis were used. Statistical significance was defined at a level of 0.05.

3. Results and Discussion

The aim of this study was to identify the role of some of the demographic variables in incidence of community pharmacist profession- related errors. In total, 64 subtasks were extracted from HTA form. The subtasks were categorized in three subgroups including tasks related to prescribed medication dispensing services, tasks related to non-prescribed or over the counter (OTC) medicines dispensing services and tasks related to pharmacy management. Using

cluster sampling, 200 pharmacists were selected for investigation (random selection in each cluster). Demographic characteristics of the study population are shown in table 1. The pharmacists supervised for 64 determinate profession- related errors and 3968 errors were recorded with a rate 36.7% totally and variation in subgroups (Table 2). The relationship between demographic characteristics and incidence of errors was investigated using a linear regression model and significant differences were confirmed by qui-square test. As shown in table 3, there are significant increase equal to 3.1 in incidence of pharmacist profession- related error in afternoon shift (p value = 0.00), 3.33 in night shift (p value = 0.00), 1.43 in male population (p value = 0.008), 3.71 in above 40 years old population (p value = 0.008) and 0.32 in long shifts (p value= 0.02). Our data indicate significant relationship exists between gender, age, work shift and frequency of errors. According to our results female pharmacists indicate fewer errors than male pharmacists that are similar to the results of nursing staff studies in Iran [7, 8]. Also, the incidence of errors in short and day shifts is significantly less than long and night shifts. Previous studies show the negative relationship between the workload or rushed work environment and pharmacist performance particularly mental activities like patient consultation [9]. The increase of medication errors following nursing bad work condition or long shift fatigue have been reported in hospital emergency department as well [10, 11]. Scientific research on employee work behavior

indicates that not only night and long shift workers suffer from worse health statues, but also fatigue, low quality sleep and irregularities in the circadian rhythm, impress their cognitive performance and incur more errors [12, 13]. The last effective variable in our study is age. Based on our results the frequency of errors increases after age 40 years old that is in contrast to a study performed on physicians [14]. The data of aforesaid study showed that younger physicians make more mistakes than physicians with more experience [14]. Some disagreements in results might be originated from the difference in many variables associated to profession, country or even definition of mistake in methodology that need further studies to explain.

In Iran health system, community pharmacists' perceived workload could be categorized into prescription related, non-prescription or OTC medicines related and management related tasks. The most articles that have published in the field of medication errors were conducted in hospital setting. Most of the articles from Iran observed hospital students and nursing staff [15]. Fortunately, the rate of medication errors in dispensing stage is lower than other stages of pharmaceutical intervention chain including drug ordering, transcription, education, administration, discharge summaries and monitoring. Lisby and her colleagues reported the lowest frequency of medication errors at dispensing stage (4%) in hospital setting [1]. A review of Iran literature reported the range between 11.4% -33.4% for medication error at

this stage that again showed the lowest percentage among other types of medication errors [15]. There is lack of evidence about the medication errors due to pharmacist profession- related errors or mistakes in community pharmacy. While the researchers of this study believe that community pharmacy is one of the most important control stations which could prevent medication errors or irrational use of medicines for a large population of patients and has a significant impact on health of society as well as cost of health system. Moreover, the effectiveness of pharmacist interventions on medication errors prevention was discussed and confirmed previously [16-18].

To our knowledge, no previous study has determined the relationship between demographic factors and pharmacist profession- related errors at the community pharmacy level. Pharmacist is technical responsible and the only person to be considered in charge of drug associated problem in pharmacy and is expected to be aware of and expert in his/her individual task performance. Based on our results, the most frequent errors are dedicated to prescribed medication dispensing services. Prescription error is a current type of medication errors around the world [19-21] and the impact of prescription screening by pharmacists in increasing rationality use of medicines and patients safety has been confirmed previously [22, 23]. Inaccessibility of prescriber to edit the prescription and lack of scientific communication between pharmacists and

prescribers might be two key reasons to explain this problem.

4. Conclusion

In conclusion, profession error is an important challenge in community pharmacies. In this study the contribution of some of the demographic factors was discussed. However, the increase of mistakes in long shift (more than 8 hours), night shift, men, and older pharmacists group could be a warning for the administrators or policy makers of community pharmacies and suggests more deep evaluation and review in work condition adjustment and adaptation. The authors hope this study would increase the attention of researchers and policy makers to the community pharmacists and the important role of them in prevention or transition of medication errors.

Acknowledgments

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Tables:

Table 1. Demographic characteristics of pharmacist were supervised for medication errors.

Variable	Frequency	Percent
Location of Pharmacy*		
North	65	32.5
West	60	30.0
East	32	16.0
South	29	14.5
Center	14	7.0
Shift Work		
Morning	81	40.5
Afternoon	96	48.0
Night	23	11.5
Gender of Pharmacist		
Male	118	59.0
Female	82	41.0
Age of pharmacist		
≤ 40	143	71.5
> 40	57	28.5
Shift duration		
4 hours shift	86	43.0
8 hours shift	114	57.0

*this study was conducted in Tehran, the capital city of Iran.

Table 2. The frequency of errors in task subgroups.

	Prescribed medication dispensing services	Non-prescribed or OTC medicines dispensing services	Pharmacy management
Male	1173	756	551
Female	698	513	277
< 40 years old	1248	908	529
> 40 years old	623	361	299
Day shift	792	529	340
Night shift	1079	740	488
Total	1871	1269	828

Table 3. Regression model to examine the relationship between error and indices.

Variable	Coefficient	Std. Err.	t	P>t	Lower (0.95 CI)	Upper (0.95 CI)
Shift work						
Afternoon	3.10	0.51	6.10	0.00	2.10	4.10
Night	3.33	0.85	3.93	0.00	1.66	4.99
Age (> 40)	3.71	0.55	6.79	0.00	2.63	4.79
Gender (Female)	-1.43	0.53	-2.68	0.01	-2.48	-0.38
Shift duration (8hour)	0.32	0.13	2.38	0.02	0.05	0.58
_cons	13.43	1.72	7.81	0.00	10.04	16.82