

## Clinical Study

### Detecting and managing drug-related problems in the neurology ward of a tertiary care teaching hospital in Iran: A clinical pharmacist's intervention

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#### ABSTRACT

**Objective:** Nowadays, the role of clinical pharmacists has become more prominent by more clinical pharmacists joining the health-care teams. This study was aimed to assess the role of a clinical pharmacist specialist in detecting and managing drug-related problems (DRPs) in the neurology ward of a tertiary care teaching hospital in Iran.

**Methods:** This is a prospective cross-sectional study conducted on 123 hospitalized patients admitted to the neurology ward of a teaching hospital. The clinical pharmacist visited the patients and filled out the designed pharmacotherapy sheet for each patient. Then, the general pharmacist checked the patients' files and pharmacotherapy sheets and categorized DRPs using modified method of "The Pharmaceutical Care Network Europe classification, Version 5.01."

**Findings:** A total of 168 errors were found and 346 interventions were done by the clinical pharmacist during the study period. The most common form of errors in our study was "drug choice problems" (57.76%). The acceptance rate of interventions was 41.91% among physicians.

**Conclusion:** The large number of interventions reported in several studies, as well as this study, revealed that clinical pharmacy services could contribute to a rationalization of drug therapy and may eventually lead to more medication safety.

**Keywords:** Clinical pharmacist's intervention; drug safety; drug-related problems; neurology ward

## INTRODUCTION

Improvement in patients' safety has always been the goal of health-care systems in most countries. However, accessibility of new drugs and enhancement in using medications have raised the risk of adverse drug events (ADEs) in hospitals. Therefore, to alleviate the problem, attempts have been made to decrease ADEs and to reach the safety standards and effectiveness of medication usage.<sup>[1,2]</sup>

One of the most common ADEs in developed countries is drug-related problems (DRPs) that can be defined as "an event including drug therapy which can actually and potentially interfere with optimal health outcomes." People admitted to hospitals are commonly faced with DRPs that are increasingly involved in morbidity and mortality and could contribute to the soaring health-care costs.<sup>[3]</sup> Apart from DRPs, medication errors can lead to ADEs. These errors may occur during prescribing

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or delivering medications which may happen by medical staffs in all stages of drug therapy in hospitals.<sup>[4,5]</sup> It is estimated that 10–30% of hospital admissions are associated with DRPs which can be prohibited by pharmacists through providing appropriate pharmaceutical interventions.<sup>[6]</sup> Clinical pharmacists play a major role in improving patients' safety and rational drug administration. Moreover, as the cost can be a concern, they can reduce the cost of improper drug therapies. To reach a safe and less costly therapy, clinical pharmacists have to participate in ward rounds and take the patients' histories and laboratory information. Moreover, they are good consultants for pharmaceutical questions raised by doctors, nurses, and patients, especially in Intensive Care Units.<sup>[7-9]</sup>

Clinical pharmacy has been taught in the USA and the UK for many decades. Starting in 1970, assessment of prescriptions by clinical pharmacists was the first step in this field in the UK. Later, with the advancement of knowledge on clinical pharmacy and improvement of the clinical pharmacists' expertise, the system of thinking was changed and as a result they were accepted as one of the health members in the hospital wards.<sup>[10-12]</sup>

In Iran, clinical pharmacy residency program started in 1994, and now more than 100 graduated clinical pharmacy specialists are in practice. Most of them are working as faculty members in universities and also in medical team in teaching hospitals. Their fields of work consist of several wards such as Intensive Care Unit, Cardiac Care Unit, oncology, nephrology, neurology, infection illness, psychiatry, and endocrine disease.<sup>[13,14]</sup>

The role of clinical pharmacists has recently become more prominent by more clinical pharmacists joining the health-care teams. This research is one of the first studies in Shiraz, the most important medical center in the South of Iran, evaluating a clinical pharmacist intervention in a teaching hospital. In this study, we aimed to evaluate the frequency and type of DRPs and the role of the clinical pharmacist in detection and prevention of these drug problems in the neurology ward of a teaching hospital.

## METHODS

This is a prospective study conducted from November 2012 to March 2013 inclusive in the 20-bed neurology ward of Shahid Faghighi Hospital, a teaching hospital affiliated to Shiraz University of Medical Sciences. The study was carried out on 123 patients, cooperatively by a pharmacotherapy specialist, a general pharmacist, and a neurologist. The Ethics Committee of the institution approved the study protocol.

In the mentioned hospital, the patients' files contain information about the patients' history, progress, laboratory data, physicians' orders, and medicine sheets. All data were manually recorded, except the laboratory data that were retrievable from Health Information System. A clinical pharmacist was present in the neurology unit 3–4 days a week and visited the patients during the first couple of days after their admission. After checking the patients' files and interviewing with either the patients or their caregivers, the appropriateness of treatment was then analyzed, and pharmaceutical care plans were documented in the pharmacotherapy consult sheets by the clinical pharmacist. The written consults were subsequently reviewed by the responsible physician (s) to make the final decision.

To classify drug problems, the modified method of "The Pharmaceutical Care Network Europe classification, Version 5.01 (this modification is based on our study requirements) was used. Then, the general pharmacist randomly checked the patients' pharmacotherapy consult sheets and compared the clinical pharmacist interventions with standard references to ensure the accuracy of the interventions.

SPSS version 21 (SPSS, Inc., Chicago, IL, USA) was used for data analysis. Descriptive statistics was used to determine the frequency of each type of DRPs.

## RESULTS

During the study period, 55 male (44.7%) and 68 female (55.3%) patients were visited by the clinical pharmacist. The patients' age ranged 21–91 years, with the mean of  $55.08 \pm 18.73$ .

Most of the patients suffered mainly from cerebrovascular disease, vertigo, headache, multiple sclerosis, brain tumors, and pseudotumors. In this study, 644 medicines were prescribed for patients and the maximum number of drugs for a patient was 12. The average number of medicines per patient was 5.23.

Totally, 168 DRPs were detected by the clinical pharmacist among the patients under study. The type and frequency of errors or problems are shown in Table 1. The percentages of each DRPs were as follows: drug choice problems (57.76%), drug dosing problems (23.2%), drug interactions (16.07%), adverse drug reactions (2.38%), and drug use problems (0.59%). One of the most common problems in drug choice was "no clear indication for drug use" that contained 47 errors, of which, 38 (80%) were related to inappropriate prescription of ranitidine for stress ulcer prophylaxis. The other problem was "no drug prescribed but clear indication" that was

related to the following drug categories: insulin and oral reducing blood sugar agents, losartan, selective serotonin reuptake inhibitors, and antihypertensive drugs. The most common problem in dosing was "drug dose too low" that was attributable to the following drugs: nitroglycerine, gabapentin, warfarin, and spironolactone.

Three hundred and forty-six interventions were done by the clinical pharmacist during the period of the study. Types and frequencies of interventions are shown in Table 2. The prescriber informed was the most frequent type of intervention.

About 41.9% of interventions were accepted by physicians, but 48.55% of interventions were not approved. The outcome of 9.59% of interventions was unknown since patients had been discharged from the ward on the day of pharmacotherapy visit, so we were not able to analyze the acceptance rate.

## DISCUSSION

DRPs are very common in patients who are admitted to hospitals. These problems may lead to patients' mortality, morbidity, and increase in their hospitalization stay and cost.<sup>[2]</sup> It has been shown that clinical pharmacist's intervention can reduce DRPs and the total drug cost during hospitalization.<sup>[15]</sup> This survey was one of the few studies that analyzed documented pharmacotherapy service by a clinical pharmacist in an Iranian hospital and the first in the neurology ward of a teaching hospital in Iran.

According to the findings, the average number of errors per patient was 1.39. The most common form of error in our study was "drug choice problems" with 57.76% of total problems which was similar to the result of an Indian study (35.13%).<sup>[2]</sup> However, in another study evaluating clinical pharmacists' interventions in nephrology and infectious disease wards of a teaching hospital in Iran, it was found that the most common error was related to "dosing problems" with 38.4% of total errors.<sup>[13]</sup> To some extent, differences in the type of DRPs in different hospitals could be explained by various wards and settings in these hospitals. Disregarding of evidence-based medicine by physicians may be one of the reasons for these errors.

One of the main duties of a clinical pharmacist is to restrict the DRPs in medical wards. For 123 patients surveyed in this study, 346 interventions were done by the clinical pharmacist with the mean of 2.8 interventions per patient, the most common form of which was found to be "prescriber informed" (28.6%). It referred to the situations in which pretreatment and/or during treatment monitoring that have not

**Table 1: Types, numbers, and frequency of errors or problems (n=168)**

Types of problems	Subcategory	n (%)
Adverse reactions	Nonallergic side effects	23 (13.68)
	Allergic side effects	0 (0)
	Toxic effect suffered	0 (0)
Drug choice problem	Inappropriate drug selection	0 (0)
	Duplication drug group	1 (0.6)
	Inappropriate dosage form	1 (0.6)
	Contra-indication for drug	1 (0.6)
	No clear indication for drug	47 (27.98)
	No drug prescribed but clear indication	47 (27.98)
Dosing problem	Drug dose too low or dosage regime not frequent	23 (13.7)
	Drug dose too high or dosage regime too frequent	16 (9.5)
	Duration of treatment too short	0 (0)
	Duration of treatment too long	0 (0)
Drug use problem	Drug not taken or administered at all	0 (0)
	Wrong drug taken as administered	1 (0.6)
Interactions	Potential drug interaction	8 (4.76)
Total		168 (100)

**Table 2: Characteristics of interventions made by the clinical pharmacist (n=346)**

Intervention	n (%)
Prescriber informed	99 (28.60)
Drug changing	24 (6.93)
Dosage changing	48 (13.90)
Formulation changing	3 (0.86)
Instruction for use changing	41 (11.85)
Drug stopping	46 (13.30)
New drug starting	85 (24.56)
Total	346 (100)

been considered by the practitioner or medical students are necessary to be done after the administration of certain drugs. In a study done in Belgian geriatrics ward, "dose changing" was the most common intervention constituting 35% of all interventions.<sup>[7]</sup> In another study evaluating the clinical pharmacy services in a teaching hospital in Iran, "drug discontinuation" (22.7%) and "changing the frequency, duration, or dose of drugs" (22.7%) were the most common interventions.<sup>[14]</sup> Differences in the distribution type of clinical pharmacist interventions in the above-mentioned studies may reflect various patterns of DRPs in these centers.

Previous studies showed different acceptance rates of clinical pharmacy interventions varying from <50%<sup>[16]</sup> to >90%.<sup>[9,14]</sup> Clinical pharmacy service is a new approach in our country, Iran, and especially so in Shiraz University of Medical Sciences affiliated

hospitals. In our study, the acceptance rate of the clinical pharmacist's intervention was 41.91%. Likewise, a value of 47.5% was reported in a European study where authors stated that there was a lack of communication and an insufficient multidisciplinary approach in their setting.<sup>[16]</sup> Moreover, a study performed in Belgium showed the acceptance rate 53.6%.<sup>[7]</sup> In another study done in Dutch; however, more acceptance rate was observed. That is 82% of interventions were accepted by the physicians.<sup>[17]</sup> In a multicenter study performed in French hospitals, the acceptance rate of the clinical pharmacists' interventions by physicians was shown to be 73.4%.<sup>[3]</sup>

Surprisingly, in a study in the capital city of Iran, Tehran, 94.5% of interventions was accepted by physicians in a teaching hospital. This high percentage of acceptance rate can be attributable to the fact that clinical pharmacy services had been provided for several decades in this setting.<sup>[14]</sup> In other words, there might be a relationship between the background of the wards in providing services and the acceptance rate which is gained.

Our study has several limitations. First, it reported interventions of a single clinical pharmacist in one neurology ward; therefore, it lacks generalizability; however, it can be a good pilot study. Second, partial registration of patients' documents made it hard to completely review their files for better assessment of interventions. Third, this study was done in a teaching hospital where medical students' attendances in the ward were rotated biweekly. Therefore, there was not sufficient time to teach them about clinical pharmacy services which were a new approach in the investigated setting. This could interfere with the acceptance rate of the clinical pharmacist interventions and made it lower than expected. Fourth, we were unable to determine what would happen to the patients if errors were left uncorrected. Further work can be done in this regard to address the impact of interventions on decreasing adverse drug effects.

The results of this study showed a high prevalence of DRPs even in a teaching hospital. However, the large number of interventions reported in several studies, as well as this study, revealed that clinical pharmacy services could contribute to a rationalization of drug therapy and may eventually lead to more medication safety. Since clinical pharmacist interventions are not known well to most of the physicians and medical students in our country, better introduction of clinical pharmacy services and their achievements can improve patient care and reduce clinical risks.

## AUTHORS' CONTRIBUTION

Farzaneh Foroughinia: Concepts, Design, Definition of intellectual content, Literature search, Clinical studies,

Experimental studies, Data analysis, Statistical analysis, Manuscript preparation, Manuscript editing and review.

Ramtin Tazarehie: Literature search, Clinical studies, Experimental studies, Data analysis, and Manuscript preparation.

Peyman Petramfar: Definition of intellectual content, Clinical studies, and Manuscript preparation.

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## Conflicts of interest

There are no conflicts of interest.

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