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Garjani, Alireza and Rahbar, M. and Ghafourian, Taravat and Maleki, Nasrin and Salimnejad, M. and Shamsmohammadi, M. and Baghchevan, V. and Aghajani, Hasan (2009) Relationship of pharmacist interaction with patient knowledge of dispensed drugs and patient satisfaction. Eastern Mediterranean Health Journal, 15 (4). pp. 934-943. ISSN 1020-3397.

### DOI

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# Relationship of pharmacist interaction with patient knowledge of dispensed drugs and patient satisfaction

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العلاقة بين تفاعل الصيدلي مع معارف المرضى عن الأدوية الموصوفة لهم وإرضائهم  
عليرضا كرجاني، مهدي رهبر، طراوت غفوريان، نسرین مالكي، آفاق كرجاني، مينا سليم نزاد، مهناز شمس  
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**الخلاصة:** أجرى الباحثون دراسة استباقية تناولت مهام الصيدلة ومعارف المرضى وإرضاءهم في 35 من الصيدليات المجتمعية التي تم اختيارها عشوائياً في تبريز في جمهورية إيران الإسلامية. وقد استحق التفاعل الإجمالي لدى الصيدلة حراً وسطياً مقداره 3.05 من أصل 5. وقد استحق تقديم توجيهات كتابية حول استخدام الدول أعلى الأحرار 0.93 من أصل 1. كما أحرز المرضى 3.18 من أصل 5 للمعارف حول أدويتهم. وكان هناك ارتباط وثيق بين معارف المرضى عن الأدوية المصروفة لهم وتفاعل الصيدلة (معامل الارتباط = 0.95). وكان وسطي الوقت الإجمالي لتقديم الوصفة 7.6 دقائق إلا أن 1.4 دقيقة فقط قضاهما الصيدلة في توعية المرضى. وإن تفاعل الصيدلة مع المرضى يزيد من معارف المرضى حول ما يُصرف لهم من أدوية ويزيد من رضاهم عن أنشطة الصيدلة.

**ABSTRACT** A prospective survey of pharmacists' tasks and patients' knowledge and satisfaction was conducted in 35 randomly selected community pharmacies in Tabriz, Islamic Republic of Iran. The total pharmacist interaction received a mean score of 3.05 out of 5. Providing written directions for use attained the highest score of 0.98 out of 1. Patients scored 3.18 out of 5 for knowledge about their medicines. There was a close correlation between patients' knowledge of dispensed drugs and pharmacist interaction ( $r = 0.95$ ). Mean total prescription filling time was 7.6 min, but only 1.4 min was spent on pharmacist-patient counselling. The interaction between pharmacist and patient increases patients' knowledge about dispensed medicines and their satisfaction with the pharmacist's activities.

## Rapport entre le dialogue pharmacien-patient, les connaissances du patient relatives aux médicaments délivrés et la satisfaction de ce patient

**RÉSUMÉ** Une étude prospective sur le rôle des pharmaciens et sur les connaissances et la satisfaction des patients a été réalisée dans 35 pharmacies de secteur sélectionnées au hasard à Tabriz (République islamique d'Iran). Le dialogue avec le pharmacien a obtenu un score moyen de 3,05 sur 5. L'écriture par le pharmacien de la posologie a donné lieu au score le plus élevé, à savoir 0,98 sur 1. Le score de 3,18 sur 5 a été atteint sur le point des connaissances des patients concernant leurs médicaments. Il existait une étroite corrélation entre les connaissances des patients sur les médicaments délivrés et le dialogue avec le pharmacien ( $r = 0,95$ ). La durée totale moyenne de l'exécution de l'ordonnance était de 7,6 minutes, mais le pharmacien ne consacrait que 1,4 minute à dispenser des conseils aux patients. Le dialogue entre le pharmacien et le patient permet à celui-ci d'avoir une meilleure connaissance des médicaments délivrés et augmente sa satisfaction vis-à-vis de la fonction du pharmacien.

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Received: 19/10/06; accepted: 11/01/07

## Introduction

Rational use of drugs, which has become an important concern of the World Health Organization (WHO) and many countries in recent years, is critical for effective treatment [1,2]. Dispensing is one of the main steps in pharmacotherapy and has an important influence on the rationality of drug use. The process necessitates the correct understanding of the instructions of the prescriber and the precise preparation and labelling of the medicine to increase patients' adherence with treatment. These elements are so crucial that any negligence could lead to treatment failure or put the care and health of the patient at risk [3,4]. Appropriate and adequate knowledge of prescribed medicines is essential for patient adherence. The quality of labelling, the time spent informing the patient and the communication skills of the dispenser all contribute to the patient compliance rate and therefore patient outcomes [5,6]. Furthermore, prescribing and dispensing errors are often discovered by pharmacists during the consultation with patients [7].

Patient satisfaction is also a key aspect of health care, and it has been shown that there is a strong relationship between communication and patient satisfaction [8]. It is suggested that the attitude of the pharmacist and specialized activities such as providing information and explanations and the convenience of opening hours are not only judged to be important by patients but also influence their satisfaction [9,10]. The ultimate goal of patient satisfaction is to improve patient care. Satisfied patients are more likely to adhere to their regimens and exhibit greater continuity with regard to appointments.

Pharmacists are responsible for continuously evaluating the success of the care they provide to ensure quality processes

and outcomes. Interaction with the pharmacist can change patients' expectations and satisfaction in areas directly related to pharmaceutical care [11]. Pharmacy nowadays is moving toward a more intervention-oriented practice. Pharmacists who work as a team with the patient providers can assist in maximizing clinical benefits and decreasing negative outcomes [12].

In the Islamic Republic of Iran the general presumption is that a pharmacist is only a medicine provider, with no real impact on patient outcomes. On the other hand, poly-pharmacy, inappropriate use of medications, short consultation times and poor patient compliance are common patterns of irrational use of drugs in this country [13,14]. Previous Iranian studies have tended to focus on the prescribing pattern of medicines and have rarely evaluated the pharmacy itself or the work of the pharmacist. To answer the question whether patient satisfaction and information about drugs, as key indicators of patient outcomes, are enhanced by effective pharmacist-patient interaction, we aimed to assess the quality of Tabriz pharmacy services by measuring aspects of pharmacist interaction and to assess patient knowledge of the dispensed drugs and satisfaction with the interaction.

## Methods

### Study design

A prospective study was conducted with a sample of 700 outpatients who received pharmaceutical care from 35 out of 181 community pharmacies in Tabriz from December to March 2005 (20 patients from each pharmacy). The pharmacies and patients were selected randomly. Patients were informed about the study objectives and procedures and that the data collected would be used only for the stated research

purpose. A prestudy assessment was made of the study procedures and data collection forms in 10 community pharmacies, using 50 outpatients. After making changes in the procedures and questionnaires based on the comments of the survey team, a pilot study was carried out in a pilot pharmacy using 90 questionnaires from 90 outpatients.

### Structured observation

A structured observation was carried out by a trained and experienced observer, who observed each pharmacist–patient interaction and the pharmacy activities. To minimize observer bias, the observer was instructed not to interfere with the consultations or dispensing process. The pharmacy staff were not informed about the nature of the survey. The observer recorded the time that the patient spent at the dispensing counter (total dispensing time) and the time during which the patient was being informed about the dispensed medicines (consultation time).

To measure pharmacist–patient interaction we created 5 dichotomous-type questions about specific pharmacist tasks. The questions enquired whether the pharmacist: asked about the patient's history and communicated with the patient verbally; provided written directions for use on the drug package; provided verbal instructions for use, if possible in laymen's terms; ensured the patient's understanding of the instructions; and answered the patient's questions about the medications in a considerate way. Questions were scored as task performed (score 1) or task not performed (score 0). To calculate the performance level of each community pharmacy in a specific task the scores were averaged for the 20 patients (maximum score per task). The total pharmacist interaction score for each pharmacy was calculated by summing the task mean scores (maximum score 5 per pharmacy).

### Patient knowledge

Using an interview questionnaire, the same patient's knowledge of dispensed drugs was registered by a second survey team pharmacist, who assessed the patient's recall of: the name of dispensed drugs; the dosage; the duration of treatment; the side-effects; and the reason for the medications. Each attribute was scored as correct (score 1) or incorrect (score 0). For each attribute patient's knowledge scores were averaged (maximum score 1 per attribute).

To calculate the overall patient knowledge score, the mean scores of attributes for each pharmacy were summed. Therefore, a total patient knowledge score of 5 indicated patient's correct information about all the questions asked. Misspelling of the names of drugs was disregarded and general explanations about the reasons for medication were considered correct. To assess the influence of pharmacy facilities on patients' satisfaction and knowledge, waiting place area and height of dispensing counter of pharmacies were also measured.

### Patient satisfaction

Five questions enquiring about the overall and differential satisfaction of patients with different aspects of pharmacy services were located at the end of the interviewing questionnaire. The questions asked about the patient's satisfaction with: the waiting time for prescription filling; the pharmacist's explanation and consultation; the availability of the drugs; the prescription costs; and the overall excellence of the services provided. The satisfaction with each item was scored as excellent (score 2), good (score 1) or poor (score 0); range 0–2 points. Scores for questions were summed to produce an overall patient satisfaction score (maximum score 10).

### Data analysis

All data were expressed as mean and standard deviation (SD) or mean score and 95% confidence interval (CI). Mean values were compared using the Student *t*-test, as appropriate. Patient knowledge and satisfaction (dependent variables) were correlated against the total pharmacist interaction score and its attributes, dispensing and consultation time, and pharmacy facilities using the Pearson correlation analysis. Stepwise multiple linear regression analysis was employed to discover the most significant factors contributing to pharmacist interaction, patient knowledge and patient satisfaction scores. The factors were selected from among total pharmacist interaction time and its attributes, pharmacy facilities, and dispensing and consultation times. The level of significance in all analyses was set at 0.05. Statistical calculations were performed with either *SPSS*, version 11.5, or *Instat*, version 2, software packages.

### Results

To evaluate the physical and functional status of Tabriz pharmacies, we collected 35 observation questionnaires from 35 randomly selected pharmacies. All the pharmacies had at least 1 and a maximum of 5 staff members as dispensers. According to the Iranian Drug Action Law, the pharmacy services should be delivered only in the presence of a pharmacist who has a PharmD degree and is responsible for dispensing the prescribed drugs as well as counselling the customers. At the time of the study, the pharmacist delivered the drug to the patient in 66% of cases and in the rest a pharmacy technician acted as dispenser.

In this study, the overall waiting time for prescription filling was 7.6 (SD 3.0) min, but only 1.4 (SD 1.3) min of that was spent on the pharmacist–patient interac-

tion, which included verbal communication between the pharmacist and patient and providing written directions for use on the drug package. The mean surface area of the waiting place was 14.4 (SD 7.5) m<sup>2</sup> and the mean height of the dispensing counter was 1.16 (SD 0.12) m.

Table 1 shows the mean scores for pharmacist–patient interaction, patient knowledge of dispensed drugs and patient satisfaction with the interaction. The pharmacist interaction received a total mean score of 3.05 out of 5 (range 2.80 to 3.30). The highest contribution to the total interaction score was from the provision of written directions for use on the drug(s) package (mean score 0.98 out of 1). Providing verbal instruction for use to patients, ensuring the patient's understanding of the directions and answering the patient's questions obtained mean scores of 0.68, 0.25 and 0.92 out of 1 respectively. Asking about the patient's history and giving a short introduction attained the lowest mean score, 0.19.

The total mean score for patient knowledge of dispensed drugs was 3.18 out of 5. Recalling the name of the drug(s) (mean score 0.93 out of 1) and duration of treatment (mean score 0.85 out of 1) were the highest contributing factors to the total score. Recall by the patient of the reason for the medication and the correct dosage received lower mean scores of 0.72 and 0.65 respectively. Patient knowledge of the possible side-effects was very poor (mean score 0.01 out of 1).

The total score for patient knowledge of dispensed drugs varied significantly depending on whether the prescription was dispensed by the pharmacist or by a pharmacy staff member ( $P < 0.002$ ). The total mean score for patient knowledge was higher [mean score 3.32 (SD 0.35)] for patients who received their medication from the pharmacist in comparison with those

**Table 1 Mean pharmacist interaction scores and patient knowledge and satisfaction scores in Tabriz community pharmacies**

Dimension/evaluation item	Mean score (95% CI)
<i>Pharmacist interaction score</i>	
Total <sup>a</sup>	3.05 (2.80 to 3.30)
Obtaining patient's history <sup>b</sup>	0.19 (0.12 to 0.26)
Providing written directions for use <sup>b</sup>	0.98 (0.95 to 1.02)
Providing verbal instructions for use <sup>b</sup>	0.68 (0.55 to 0.81)
Ensuring patient's understanding of instructions <sup>b</sup>	0.25 (0.16 to 0.33)
Answering patient's questions about medications <sup>b</sup>	0.92 (0.85 to 0.99)
<i>Patient knowledge score</i>	
Total <sup>a</sup>	3.18 (3.04 to 3.32)
Recalling name of dispensed drugs <sup>b</sup>	0.93 (0.91 to 0.96)
Recalling correct dosage of dispensed drugs <sup>b</sup>	0.65 (0.58 to 0.72)
Recalling duration of the treatment <sup>b</sup>	0.85 (0.81 to 0.89)
Recalling side-effects of dispensed drugs <sup>b</sup>	0.01 (0.00 to 0.02)
Recalling reason for medications <sup>b</sup>	0.72 (0.66 to 0.78)
<i>Patient satisfaction score</i>	
Total <sup>c</sup>	5.20 (4.90 to 5.50)

<sup>a</sup>Maximum score 5; <sup>b</sup>maximum score 1; <sup>c</sup>maximum score 10.  
CI = confidence interval.

who obtained it from a pharmacy technician [mean score 2.85 (SD 0.29)]. The estimate for the difference was 0.45 (95% CI 0.18–0.72). However, patient satisfaction was not significantly different comparing those receiving services from a pharmacist [mean score 5.36 (SD 0.86)] and those receiving services from a pharmacy technician [mean score 4.90 (SD 0.66)] ( $P = 0.120$ ).

The effect of the performance level of pharmacies on patient knowledge of dispensed drugs and patient satisfaction was investigated using correlation analysis. The analysis was performed between patient knowledge or patient satisfaction scores as the dependent variable and total pharmacist interaction score or its contributing elements (pharmacists' tasks), total dispensing time, consultation time, surface area of waiting place and height of dispensing counter as independent variables. There was a strong positive relation between the total pharmacist interaction score and patient knowledge

( $r = 0.93$ ;  $P = 0.0001$ ) (Table 2). The degree of satisfaction was also significantly associated with the total pharmacist interaction score ( $r = 0.44$ ;  $P = 0.008$ ). Close positive correlations were observed between patient knowledge of dispensed drugs and some of the specific pharmacist tasks, including mean scores for obtaining patient's history, provision of verbal directions (explanation of labelling) and ensuring patient understanding. Only mean score for provision of verbal directions, however, was associated significantly with the patient satisfaction score ( $r = 0.57$ ;  $P = 0.0003$ ). There was no correlation between patient knowledge or satisfaction scores with the area of the pharmacy waiting room or the height of the dispensing counter ( $P > 0.35$ ). Although patient knowledge of dispensed drugs was not related to the total dispensing time, it was markedly associated with counselling time ( $r = 0.64$ ;  $P = 0.0001$ ). A significant inverse relationship ( $r = -0.56$ ;  $P = 0.0005$ )

Table 2 Pearson correlation analysis of factors associated with patient knowledge of dispensed drugs and their satisfaction

Variable	Knowledge		Satisfaction	
	r (95% CI)	P-value <sup>a</sup>	r (95% CI)	P-value <sup>a</sup>
<i>Pharmacist interaction score</i>				
Total pharmacist interaction score	0.93 (0.86 to 0.96)	0.0001	0.44 (0.12 to 0.67)	0.008
Obtaining patient's history	0.79 (0.62 to 0.89)	0.0001	0.26 (-0.08 to 0.55)	0.132
Providing written directions for use	0.33 (-0.01 to 0.60)	0.054	-0.07 (-0.39 to 0.27)	0.689
Providing verbal instruction for use	0.80 (0.64 to 0.89)	0.0001	0.57 (0.29 to 0.76)	0.0003
Ensuring patient's understanding of instructions	0.84 (0.70 to 0.92)	0.0001	0.32 (-0.01 to 0.59)	0.055
Answering patient's questions about medications	0.35 (0.01 to 0.61)	0.041	0.11 (-0.24 to 0.42)	0.545
<i>Interaction time</i>				
Total dispensing time	-0.01 (-0.34 to 0.32)	0.943	-0.56 (-0.75 to -0.28)	0.0005
Consultation time	0.64 (0.34 to 0.80)	0.0001	0.38 (0.05 to 0.63)	0.025
<i>Pharmacy facilities</i>				
Floor space of waiting area	-0.15 (-0.46 to 0.19)	0.384	-0.06 (-0.39 to 0.27)	0.720
Height of dispensing counter	-0.10 (-0.42 to 0.24)	0.578	-0.08 (-0.40 to 0.26)	0.658

<sup>a</sup>Two-tailed P-value.

r = correlation coefficient; CI = confidence interval.

was observed between total dispensing time and patient satisfaction score. Consultation time, however, had a positive and significant influence on patient satisfaction ( $P < 0.05$ ).

In order to identify the factors which were most influential on patient satisfaction and knowledge, stepwise regression analyses were performed between patient satisfaction or knowledge scores as the dependent variable and the possible underlying factors of total interaction score and its attributes, total dispensing time, consultation time, surface area of waiting room and height of dispensing counter as the independent variables (Tables 3 and 4). A significant and marked correlation was observed between pharmacist-patient interaction (beta = 0.82;  $P = 0.0001$ ) as well as pharmacist consultation time (beta = 0.21;  $P = 0.005$ ) and patient knowledge score. Likewise, pharmacist consultation time and waiting room area had positive and significant influences on patient satisfaction

( $P = 0.0001$ ;  $P = 0.01$ ). Again, a significant inverse relationship was identified between total dispensing time and satisfaction score (beta = -0.77;  $P = 0.0001$ ).

Total interaction score, as the underlying factor in patient knowledge, was further analysed through stepwise regression in order to identify the specific tasks with higher promoting effects as the predictors. The most effective tasks in promoting the pharmacist-patient interaction score were provision of verbal instructions (beta = 0.39;  $P = 0.0001$ ) and obtaining patient's history (beta = 0.32;  $P = 0.0001$ ) (Table 5). Provision of written directions was the least effective parameter (beta = 0.09;  $P = 0.013$ ).

## Discussion

In this study the mean scores of 3.05 and 3.18 for pharmacist-patient interaction and

Table 3 Stepwise regression analysis of patient knowledge of dispensed drugs<sup>a</sup>

Variable	Unstandardized coefficient		Standardized coefficient	t-value	P-value
	B	SE	Beta		
(Constant)	1.790	0.099	–	18.080	< 0.001
Total pharmacist interaction score	0.426	0.035	0.82	12.006	< 0.001
Consultation time	0.067	0.022	0.21	3.055	0.005

<sup>a</sup>Total patient knowledge of dispensed drugs analysed against total pharmacist interaction score, total dispensing time, dispensing consultation time, floor space of waiting area and height of dispensing counter. Correlation coefficient of multiple regression equation was 0.945; only parameters with  $P < 0.05$  were accepted. SE = standard error.

patient knowledge represent 61% and 63% of the total scores respectively. Patient knowledge of the dispensed drugs is one of the essential prerequisites for patient compliance with treatment. On the other hand, the quality of the consultation and information provided by pharmacy staff is the important determinant of patient knowledge [15,16]. A strong and positive relationship between the pharmacist–patient interaction and patient knowledge and satisfaction in this study confirms the essential role of the pharmacist in promoting patient adherence to medications.

The mean dispensing consultation time in Tabriz was 1.35 (SD 1.3) min. In comparison with the total prescription filling time [7.6 (SD 3.0) min] the consultation time was short, but compared to some other studies the time was relatively good. In a Nigerian study the mean dispensing counselling time was 13 s [17] and in a study from Botswana it was 25 s [4]. The counselling time during dispensing, which includes verbal communication between the pharmacist and the patient, is an effective indicator of better patient knowledge and satisfaction.

Among the pharmacist tasks, the communicative tasks such as “obtaining patient’s history”, “providing verbal instructions for use”, and “ensuring patient’s understanding of instructions” had the most positive relationship with patient knowledge. Although

“providing written directions for use” on the drug package attained a high mean score of 0.98 out of 1, it had no significant effect on patient knowledge. This indicates that written directions are useful only when they are accompanied by an explanation. The person dispensing the drugs is in a position to reinforce the information about the medications.

In this study we found that, compared to the general dispensing staff, pharmacists imparted a more satisfactory level of knowledge to patients. This shows that the level of qualification and education of dispensers is one of the main determinants of patient knowledge of dispensed drugs. However, patient satisfaction did not differ between patients who received service from a pharmacist or those who received service from a staff member. Patient expectations and attitudes play important roles in their evaluation of a service; therefore we believe that real satisfaction occurs when it matches knowledge. It has been shown that communication with the pharmacist at community pharmacies or communication with the physician during the examination is strongly related to patient satisfaction [9,18].

In addition to consultation time, provision of verbal directions by pharmacists considerably influenced patient satisfaction, while total waiting time at the counter had the reverse effect on satisfaction.



Table 4 Stepwise multiple linear regression analysis of predictors associated with patient satisfaction

Variable	Unstandardized coefficient		Standardized coefficient	t-value	P-value
	B	SE	Beta		
(Constant)	5.789	0.284	–	20.351	< 0.001
Total dispensing time	–0.215	0.033	–0.77	–6.476	< 0.001
Consultation time	0.383	0.074	0.61	5.154	< 0.001
Floor space of waiting area	0.036	0.013	0.34	2.771	0.009

Correlation coefficient of multiple regression equation was 0.798; only parameters with  $P < 0.05$  were accepted. SE = standard error.

Total pharmacist interaction score was the most important parameter in increasing patient knowledge, and consultation time was the second most important factor that leads to greater patient knowledge. Although more robust investigation is required to assess the outcome of pharmacy-based intervention on the knowledge and attitudes of patients, this preliminary finding could have interesting implications with regard to the feasibility of effective education for patients through community pharmacies. This is because, with the majority of patients receiving written directions for use, the variation in this task has become limited.

Although obtaining the patient's history and provision of verbal instruction were the most effective factors in increasing the total pharmacist interaction score, it cannot be concluded that they are the prominent factors affecting patient knowledge. Therefore, patient knowledge was directly correlated against specific pharmacist tasks using stepwise regression. The standardized coefficients value of various tasks showed that ensuring patient understanding and provision of verbal drug information were the most effective tasks in promoting patient knowledge. In the interpretation of this result it should be borne in mind that, clearly, ensuring patient understanding is not possible without first providing verbal drug information. Therefore it is only

logical to assume that, although ensuring patient understanding is a more significant parameter than provision of verbal drug information according to the statistical analysis, it cannot be concluded that the latter is a less effective factor in promoting patient knowledge.

Patient satisfaction, the other key factor investigated in this study, was influenced by total dispensing time, consultation time and waiting room area in descending importance according to the standardized coefficients. Total dispensing time inversely affected patient satisfaction, whereas patients appreciated consultation time and the waiting room area. Increasing significance level to  $P < 0.10$ , a fourth parameter (providing verbal instructions to patients) will be permitted in the multiple regression analysis with a positive effect on patient satisfaction.

## Conclusions

This study showed that the interaction and consultation of pharmacists with patients increases patient knowledge of dispensed medicines and satisfaction. Communicative tasks had the most positive relationship on patient knowledge and satisfaction. However, writing directions for use on the drug package, which is the routine practice of pharmacists, had no significant effect on

**Table 5 Stepwise regression analysis of total pharmacist interaction score and total patient knowledge score against specific pharmacist tasks**

Evaluation item/variable	Unstandardized coefficient		Standardized coefficient Beta	t-value	P-value
	B	SE			
<i>Pharmacist interaction score</i>					
(Constant)	-0.072	0.423	-	-0.170	0.866
Obtaining patient's history	1.284	0.180	0.32	7.127	< 0.001
Providing verbal instructions for use	0.831	0.092	0.39	9.001	< 0.001
Answering patient's questions about medications	1.012	0.140	0.26	7.225	< 0.001
Ensuring patient's understanding of instructions	0.912	0.138	0.29	6.593	< 0.001
Providing written instructions for use	1.172	0.443	0.09	2.646	0.013
<i>Patient knowledge score</i>					
Constant	2.385	0.100	-	23.885	< 0.001
Ensuring patient's understanding of instructions	0.747	0.108	0.46	6.937	< 0.001
Providing verbal instructions for use	0.382	0.071	0.34	5.359	< 0.001
Obtaining patient's history	0.601	0.139	0.29	4.320	< 0.001
Answering patient's questions about medications	0.252	0.109	0.12	2.305	0.028

Correlation coefficients of multiple regression equations were 0.985 for total pharmacist interaction score and 0.964 for total patient knowledge score; only parameters with significance level  $P < 0.05$  were accepted. SE = standard error.

patient knowledge, indicating that written directions are useful only when they are accompanied by an explanation. The most effective tasks in promoting the pharmacist-patient interaction score were provision of verbal instruction and obtaining patients' history. We also showed that, compared to dispensing by pharmacy technicians, dispensing by pharmacists resulted in a higher level of knowledge in patients.

## Acknowledgements

This study was supported by the Research Vice-Chancellors of Tabriz University of Medical Sciences. The authors thank to all pharmacists involved in the study for their cooperation and hospitality, faculty members of Tabriz Faculty of Pharmacy and colleagues at the Directorate General of Drugs and Food.

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