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Short Communication

The Role of Clinical Pharmacists in Educating Nurses to Reduce Drug-Food Interactions (Absorption Phase) in Hospitalized Patients

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Abstract

Drug-food interactions can increase or decrease drug effects, resulting in therapeutic failure or toxicity. Activities that reduce these interactions play an important role for clinical pharmacists. This study was planned and performed in order to determine the role of clinical pharmacist in the prevention of absorption drug-food interactions through educating the nurses in a teaching hospital affiliated to Shahid Beheshti University of Medical Sciences, Tehran, Iran. The rate of interactions was determined using direct observation methods before and after the nurse training courses in four wards including gastrointestinal-liver, endocrine, vascular surgery and nephrology. Training courses consisted of the nurse attendance lecture delivered by a clinical pharmacist which included receiving information pamphlets. Total incorrect drug administration fell down from 44.6% to 31.5%. The analysis showed that the rate of absorption drug-food interactions significantly decreased after the nurse training courses ($p < 0.001$). Clinical pharmacist can play an important role in nurse training as an effective method to reduce drug-food interactions in hospitals.

Keywords: Interaction; Food; Clinical pharmacist; Nurse.

Introduction

Drug-food interactions are important aspects of treatment among hospitalized patients. Foods may alter the effects of drugs by interfering with pharmacokinetic such as absorption, metabolism and excretion. Pharmacodynamic mechanisms also play a critical role in drug food interactions by altering drug effects (1).

Lewis designed a study to assess the risk of drug-food interactions in 3 long-term-care facilities in central New York State. Fifty three patients were selected randomly from each facility. Data was gained from the medical files during 6 months and a computerized algorithm was used to assess the risk for drug-food interactions. They showed that there are 1.43, 2.69, and 1.43 per patient per month potential drug-food interactions respectively in 3 facilities (2).

Absorption drug-food interactions occur when drug or food or both interact in absorption of each other. For instance, absorption of captopril decreases significantly if it is not taken with an empty stomach. On the contrary, the curing effect of some drugs might be adversely affected by meals (3).

Patients need to be aware of the preventive ways of absorption food-drug interaction regarding its importance so that they would control their drug usage in order to get the best

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effect of the treatment. Focusing on educating patients and healthcare workers absolutely helps in this regard (4). Many methods were utilized to reduce drug-food interactions including drug prescription standard tables (4), hospital newsletters (5), educational in services (6), label systems (7), patient written and/or verbal counseling (8) and finally computerized interaction control (9).

The role of clinical pharmacist in reduction of absorption drug-food interactions by nurse education was evaluated through this study after measuring the rate of interactions before and after the intervention.

Experimental

This study was an interventional research in a before-after design from April 2007 to December 2008 in a teaching hospital affiliated to Shahid Beheshti University of Medical Sciences, Tehran, Iran. Four wards with the greatest prescription rate of oral drugs during the past 6 months were selected to carry out the study. This information was gathered from the central pharmacy of the hospital. Patients hospitalized in four wards (gastrointestinal-liver; vascular surgery; endocrine and nephrology) were evaluated for drug-food interaction rate before and after nurse-training. This study was carried out in three distinct phases:

Phase 1: Observation before training

Drug-food interactions were recorded prospectively by a trained pharmacy student via monitoring drug and food consumption. Monitoring was done via direct observations during hospitalisation for each patient. Drug-food interactions were defined as "taking drugs away from the suitable time related to food consumption based on drug information textbooks". International references of drug-food interactions (10, 11), define two categories of drugs. These are defined in our study as:

- Drugs that must be taken in a specific manner regarding food consumption.
- Drugs without any significant interactions with food.

Patients in each ward were observed for a time period of 2 months with consideration of turnover rate of the wards. There are 3 distinct working shifts (morning, afternoon and night) in each ward. As nurses were changed in each working shift, the observer attended different shifts in the wards.

Phase 2: Nursing staff training

During the second phase, all the nurses working in the four wards received training about all aspects of drug-food interactions via attending the classes supervised by a clinical pharmacist and by giving the information pamphlets in which the guiding tables of drug and food usage were illustrated. Pamphlets were prepared and distributed to the nurses by the same clinical pharmacist.

These actions were managed by the nursing management department of the hospital with the aim of upgrading the knowledge of registered nursing staff and didn't interfere with their normal work shift.

Phase 3: Re-Observation after nurse training

The third phase started one month later after nurse training in each ward to re-evaluate drug-food interactions using the interaction categories mentioned previously. This phase was done in 1 month and like phase 1, the observer attended the wards at different working shifts.

Data analysis

Data were analyzed using "Mini Tab" statistical software and compared by chi-squared test. p-value < 0.05 was considered significant.

Results and Discussion

Direct observations of drug-food interactions were done for 460 hospitalized patients. Overall, 7000 direct observations were done during the study among which 5244 belonged to the first phase and 1756 to the third one. Drug usage observations were classified to 2 categories included:

A: Drugs which must be used in a specific way regarding food.

B: Drugs which do not have any specific way of being used regarding food and patients can take them without any concern about food.

Table 1. Comparison between the wards for incorrect drug consumption rates before and after the nurse education courses.

	Before education				
	Total observations	**A**	**B**	**A_1(% from A)**	**A_2(% from A)**
GI-Liver	1384	865	519	456 (52.7)	409 (47.3)
Vascular surgery	1236	736	500	381 (51.8)	355 (48.2)
Endocrinology	1303	816	487	466 (57.1)	350 (42.9)
Nephrology	1321	787	534	471 (59.8)	316 (40.2)
Total	5244	3204	2040	1774 (55.4)	1430 (44.6)
	After education				
	Total observations	**A**	**B**	**A_1(% from A)**	**A_2(% from A)**
GI-Liver	403	287	116	157 (54.7)	130 (45.3)
Vascular surgery	270	153	117	100 (65.4)	53 (34.6)
Endocrinology	557	393	164	287 (73)	106 (27)
Nephrology	526	417	109	312 (74.8)	105 (25.2)
Total	1756	1250	506	856 (68.5)	394 (31.5)

A: Drug usage observations that must be in a specific way regarding food.

B: Drug usage observations that have not a specific way of usage regarding food.

A_1: Drug observations of category A that usages were in correct way.

A_2: Drug observations of category A that usages were in incorrect way.

Observations in category "A" showed that there were drugs used in correct (A_1) and incorrect (A_2) ways. Table 1 illustrates these results in each ward separately.

Most of the incorrect usages were observed with Hydrochlorothiazide, Captopril and Gemfibrozil in both phase 1 and phase 3.

Data showed that 44.6% of drug-takings through the first phase were incorrect regarding the food. The Vascular surgery ward had the most incorrect drug consumption pattern followed by the gastrointestinal- liver, endocrinology and nephrology wards, respectively.

Total incorrect drug consumption was 31.5% in the phase 3, after the nurse training. The gastrointestinal-liver ward had the most percentage of incorrect drug-taking followed by the wards of vascular surgery, endocrinology and nephrology, respectively. This means that total incorrect consumption rate of drug regarding food in the mentioned wards fell by 13.1% after training the nurses. Furthermore, a significant reduction of incorrect usage of drug were revealed after training the nurses of vascular surgery, endocrinology and nephrology wards, ($p < 0.002$, $p < 0.0001$ and $p < 0.0001$, respectively) although no significant reduction was found in gastrointestinal-liver ward in this matter ($p = 0.56$).

Nurses, the main target population in this study, were asked for age, sex and the period of work-time in the wards. The ratio of beds on nurses was defined in each ward, separately. These data are illustrated in Table 2.

Physicians, pharmacists and nurses are three healthcare professionals who are trained in the roles and side effects of drugs and ways to reduce many adverse outcomes of prescribing them. Their knowledge and role in patient education in various areas is also important. It is likely that these healthcare professionals lack time and knowledge of properly manage drug-food interactions. Heavy work loads and insufficient training may contribute to this. Hayley *et al.* studied 30 healthcare workers in 7 wards including physicians, pharmacists and nurses. They found that only 66.6% of them have some knowledge of drug-good interactions (12).

There are few studies about the effect of nurse education in prevention or alleviation of drug-food interactions (5, 6). Gauthier

Table 2. Characteristics of studied nurses and wards.

Wards	Nurses				Number of beds	Ratio of beds(n) /nurses(n)
	Total	Male	Female	Average experience (Yrs)		
Gastrointestinal-liver	13	2	11	5.6	50	3.8
Vascular surgery	6	0	6	10.1	20	3.3
Endocrinology	8	2	6	7.8	20	2.5
Nephrology	7	0	7	7.4	20	2.8

evaluated the effect of 2 interventions on decreasing drug nutrient interactions: 1-placement of a brightly colored label in the medication drawer and on the cover of the nursing medication card flip-chart, 2-placement of the labels plus a five-minute structured patient-counseling session. These interventions caused 19% and 16% decrease in rate of drug nutrient interactions, respectively (7). By using educational in services, DePestel *et al*. showed that training the nurses reduced the rate of interactions of fluoroquinolone and tetracycline with multivalent cations no more than 10% (13). As the nurses are the last link of treatment chain in the hospital, hypothesis of the study was that the nurse training of drug regarding food interactions could decrease drug-food interactions rate in the hospital. Unlike Depetsel *et al.*, we prefer to evaluate the nurse education by attending the classes and giving educational pamphlets of drug regarding food interactions. Average experience of evaluated nurses was not less than 5 years in this study. In this case, a great deal of theoretical knowledge would be forgotten because of their daily act and business.

In this study, we chose direct nurse education method of drug regarding food interactions by clinical pharmacist. It has been shown that drug-food interactions decreased by 13.1% after nurse training. It was observed that unlike the other wards, the gastrointestinal-liver ward did not show a significant reduction in errors following the nurse training ($p = 0.56$). May be the higher bed to nurse ratio in this ward leads such a result. Nurses in this ward also had less experience than the other wards. The periodic provision of training the nurses should be part of the normal role of the clinical pharmacists and be allowed in their work requirement. It suggests that educational programs about drug-food interactions should be provided periodically to nurses by clinical pharmacist.

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