

## An Investigation of Drug Interactions in Hospital Pharmacy Prescriptions

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### Abstract

Drug therapy is a complex and important process and because of the importance of drug interactions, especially in in-patients, accompanying problems and obstacles would exist as a result of concomitant use of drugs in these patients. For this purpose 3130 prescription order forms from Bou-Ali hospital were collected and all potential drug interactions present were extracted and evaluated in terms of significance, severity, documentation and onset.

Interactions were divided into 5 groups based on their significance, with group 1 being the most important and group 5 the least important.

Most interactions observed belonged to groups 4 and 5, accounting for 68.5% of all interactions. Group 1 interactions only accounted for 7.8% of all interactions observed.

When considering the onset of interactions, the most dominant type (55.8% of all interactions) were the slow-occurring ones. In terms of the severity, most interactions (47.2%) were of the medium (moderate) type. Strong (severe) interactions only accounted for 8.2% of all interactions.

Finally, in terms of the documentation of interactions, the most prevalent type were the probable ones, accounting for 56.8% of all interactions observed. Definite interactions only accounted for 4.3% of all interactions.

**Keywords:** Drug interaction; Hospital prescription; Prescription; Significance of interaction.

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### Introduction

Concomitant use of several drugs for a patient is often necessary for achieving a set goal or in cases when the patient is suffering from more than one disease. In these cases the chance of encountering drug - drug interactions could increase (1).

The term "drug interaction" is used when the effects of a drug in the presence of other drugs, food, beverages or environmental and chemical factors, alters (2).

The clinical output of such interactions could appear as antagonism, synergism or idiosyncraticism (3).

In a study by Galley et al., it was found that

from a total number of 160 patients in the internal ward, 221 cases of interaction exists, in which 24 were of the major type, 115 of the moderate type and 82 minor interactions. In addition it was found that the presence of certain diseases such as kidney failure, or the use of more than 6 drug items, could increase the probability of drug interactions (4).

In another study by Borda et al., drug interactions in the in-patients of various wards were studied. These interactions accounted for 22% of all cases of drug-drug interactions observed in the hospital (5).

Dipiro and Sislay found in another study that most interactions observed in hospital with patients undergone surgery is due to H<sub>2</sub>-blockers (especially cimetidine), digoxin and warfarin with the anesthetic drugs (6). Finally, Stanszcx and Franklin found that drug

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**Table 1.** A summary of prescriptions evaluated in various wards of Bou-Ali hospital.

Ward	Number of prescriptions	Number of interactions	Type of interactions	Number of prescribed drugs	Mean number of drugs prescribed
CCU	400	598	80	40	5.0
ICU	380	342	58	32	5.7
Internal	1250	1763	151	58	4.4
Infectious	1100	1257	131	39	4.2

interactions in out-patients amounts to 23% of all cases of drug interactions studied (7).

Therefore, because of the importance of drug - drug interactions, in this study attempts were made to investigate the occurrence and extent of drug interactions in the prescriptions of ICU, CCU, internal and infectious wards of Bou-Ali teaching hospital, Tehran, Iran.

### Experimental

In this study the extent of occurrence and frequency of potential drug interactions were investigated based on the reference text "Drug Interaction Facts". This particular reference was used because of its extensive and unique classifications of drug interactions.

In this study a total number of 3130 prescriptions from in-patients of ICU, CCU, internal and infectious wards of Bou-Ali teaching hospital were examined during the first 6 months of 2000 and all the potential drug interactions present were extracted and classified in terms of significance, onset, severity and documentation.

### Results

Among the prescriptions examined 3960 cases and 156 types of interaction were observed.

Table 1 shows the overall results obtained from assessing prescriptions of various wards. The overall results obtained in terms of significance, onset, severity and documentation are shown in Tables 2-5 and can be summarised as follows:

In terms of the significance, the most frequent interactions observed were of types 4 and 5 (the least important), with a total number of 2712 cases of interactions, accounting for 68.5% of the total number of interactions observed.

With regards to the onset of action, the most dominant type of interactions were the delayed ones, with a total number of 2211 cases, representing 55.8% of the total number of interactions observed.

When considering the severity of interactions, moderate interactions were dominant, with a total number of 1869 cases,

**Table 2.** Frequency distribution of 598 number of interactions ( 80 types) observed in the CCU ward of Bou-Ali hospital.

Parameter studied	Number of Interactions	Percentage of interactions	Type of Interactions	Percentage of interactions
Significance of interactions:				
1.0	39	6.5	7	8.7
2.0	89	14.9	8	10.0
3.0	36	6.0	6	7.5
4.0	238	39.8	32	40.0
5.0	196	32.8	27	33.8
Onset of action:				
Delayed	193	32.3	40	50.0
Rapid	405	67.8	40	50.0
Severity of interactions:				
Major	47	7.9	10	12.5
Moderate	325	54.3	41	51.2
Minor	226	37.8	29	36.3
Documentation of interactions:				
Established	15	2.5	3	3.7
Probable	106	17.8	10	12.5
Suspected	44	7.4	8	10.0
Possible	398	66.5	48	60.0
Unlikely	35	5.8	11	13.8

**Table 3.** Frequency distribution of 342 number of interactions ( 58 types) observed in the ICU ward of Bou-Ali hospital.

Parameter studied	Number of interactions	Percentage of interactions	Type of interactions	Percentage of interactions
<b>Significance of interactions:</b>				
1.0	12	3.5	5	8.6
2.0	66	19.3	9	15.5
3.0	4	1.2	2	3.5
4.0	163	47.6	22	37.9
5.0	97	28.4	20	34.5
<b>Onset of action:</b>				
Delayed	149	43.5	29	50.0
Rapid	193	56.5	29	50.0
<b>Severity of interactions:</b>				
Major	19	5.5	6	10.3
Moderate	245	71.7	32	55.2
Minor	78	22.8	20	34.5
<b>Documentation of interactions:</b>				
Established	13	3.8	6	10.3
Probable	20	5.8	4	7.0
Suspected	48	14.0	6	10.3
Possible	205	60.0	36	62.1
Unlikely	56	16.4	6	10.3

accounting for 47.2% of the total number of interactions observed.

Finally, in terms of the documentation of interactions observed, the most prevalent interactions were of the “possible” type, with a total number of 2250 cases, accounting for 56.8% of the total number of interactions. “Established” interactions only accounted for 4.3% of all interactions.

## Discussion

Drug interaction is a very important issue in drug therapy, especially in pediatric and geriatric patients. In the earlier parts of this article (introduction) some of the results obtained by the other researcher have been mentioned. However, it should be noted that since the protocol for conducting these studies

**Table 4.** Frequency distribution of 1763 number of interactions (151 types) observed in the intenal ward of Bou-Ali hospital.

Parameter studied	Number of interactions	Percentage of interactions	Type of interactions	Percentage of interactions
<b>Significance of interactions:</b>				
1.0	122	6.9	10	6.6
2.0	321	18.2	29	19.2
3.0	112	6.3	9	6.0
4.0	479	27.2	46	30.5
5.0	729	41.4	57	37.7
<b>Onset of action:</b>				
Delayed	1064	60.4	91	60.3
Rapid	699	39.6	60	39.7
<b>Severity of interactions:</b>				
Major	163	9.3	13	8.6
Moderate	792	44.9	77	51.0
Minor	808	45.8	61	40.4
<b>Documentation of interactions:</b>				
Established	95	5.4	10	6.6
Probable	268	15.2	22	14.5
Suspected	168	9.5	15	9.9
Possible	1052	59.7	86	57.0
Unlikely	180	10.2	18	12.0

**Table 5.** Frequency distribution of 1257 number of interactions (131 types) observed in the infectious ward of Bou-Ali hospital.

Parameter studied	Number of interactions	Percentage of interactions	Type of interactions	Percentage of interactions
Significance of interactions:				
1.0	134	10.7	6	4.6
2.0	277	22.0	27	20.6
3.0	36	2.9	5	3.8
4.0	229	18.2	37	28.2
5.0	581	46.2	56	42.8
Onset of action:				
Delayed	805	64.0	81	61.8
Rapid	452	36.0	50	38.2
Severity of interactions:				
Major	98	7.8	10	7.7
Moderate	507	40.3	67	51.0
Minor	652	51.9	54	41.3
Documentation of interactions:				
Established	48	3.8	7	5.3
Probable	251	20.0	19	14.5
Suspected	138	11.0	11	8.4
Possible	595	47.3	76	58.0
Unlikely	225	17.9	18	13.8

could be somewhat different from that of the present study, variation in the results obtained is expected.

Generally speaking the most prevalent type of interactions observed in our study are types 4 and 5, accounting for 68.5% of all interactions observed. This shows that in most cases the drugs prescribed for patients will not cause any serious or fatal interactions. Nevertheless, 7.7% of all interactions were due to type 1 interactions, meaning that patients life could be at risk and in such cases the physician and nursing staff should keep the patient under close surveillance. Furthermore, the infectious ward had the highest number of type 1 interactions, which is probably due to the nature of treatment and the need for combined drug therapy.

Regarding the onset of action, 55.8% were of the delayed type, which could take up to several days or weeks to occur, needing no immediate concern or medical intervention.

When considering the severity of interactions, 8.2% of all interactions were due to "major" interactions, and in such cases the life of patient could be threatened and immediate medical intervention is required. Furthermore, patients should be kept under close observation to prevent any complications.

In terms of the documentation of interactions observed, only 4.3% of all interactions were due to "established" interactions. It should be noted that proper monitoring of patients, a reduction in the dosage regimen, increasing the dosing intervals, etc. could help to reduce risks of severe drug interactions.

In fact the most important parameter to be considered is to find whether a drug could interact with other drugs, and try to find a way to encounter this problem.

In conclusion, it could be said that in this study drug interactions do not appear to cause a serious problem to the health of patient and process of drug therapy. However, further clinical studies are needed to be carried out in order to investigate the actual clinical occurrence of drug interactions.

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