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Clinical pharmacist's interventions in Iraqi hospitals

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Abstract
Pharmaceutical sciences mainly deal with drugs, their discovery, formulation, and healthcare delivery. Pharmacy, as a profession, deals with drug compounding, labeling, and dispensing, to reach optimal therapeutic outcomes. Clinical pharmacy is the discipline related to use of medications by patients, as well as monitoring, intervention and provision of services related to their use; hence, clinical pharmacists are those who are dedicated to these responsibilities, and so they are considered as team members involved in the provision of health care.
Clinical pharmacy in Iraq is one of the pioneers in the region; however the activities of clinical pharmacists had little documentation to highlight their efforts. This paper focuses on the documented scientific activities of the first year clinical pharmacy program trainees regarding interventions made by them being members of the clinical team. The results highlight the fact that close relationship among clinical pharmacists, doctors, nurses and patients should improve patient's use of medicines reaching to the rational use of drugs.

Keywords: healthcare delivery, medications, clinical pharmacy, Iraqi hospitals

Introduction
Pharmacy is the art and science of preparing and dispensing medications and the drug–related information to the public; hence it involves many activities starting from the prescription and ending with the use and monitoring [1]. Being members in the health team, in public and private sectors, pharmacists have been involved in provision of health and hence improved health outcomes and quality of life as well as improving the economic burden on societies [2-4].
Clinical pharmacy is the discipline in the pharmacy profession which is patient rather than drug oriented, and hence clinical pharmacist's activities are patient centered, and their collaboration with the health team has added values for improving health and reducing medication errors. Their activities and practices include health systems, community pharmacies, clinics, pharmaceutical industry and governmental agencies. Patient oriented practices also include drug policy management, research, education, nuclear pharmacy, drug information, psychotherapy, clinical pharmacokinetics, and many other aspects as well as many expanding areas within this field, which all makes the clinical pharmacist active in the therapeutic decision-making process and improving the quality of life, and an active player in the field of rational use of drugs and medical devices [5-14]. Drug shortages have been solved at the patient side by the activities of choosing the appropriate alternatives by clinical pharmacists. This had positive consequences on reducing adverse events, medication errors, delayed care, and other patient harms [15-19]. In contrast to many settings, the relatively sufficient number of clinical pharmacists, the stable way of clinical pharmacy practicing, the positive relationship and acceptance between the clinical pharmacists and the physicians as well as good communication fade the fear of physicians from losing their professional autonomy which is seen in other settings [20-24].
In Iraq, academic education of pharmacists focuses on composition, interaction, and use of medications, hence graduated pharmacists are capable of both traditional and clinical pharmacy activities. Pharmacists practice in hospitals is of different types: managing drug stores, managing in-patient pharmacies, managing out-patient pharmacies, clinical pharmacy which focuses on patient-focused pharmaceutical care. The number of clinical pharmacists in hospitals depends on the size of the hospital. Functions of clinical pharmacists include supplying medications to inpatients, educating patients about the proper use of medications, providing physician and nurse consultations, and other patient-focused and specialized activities [25].
According to the Law of Medical Graduation number 6 of the year 2000 newly graduated pharmacists who are enrolled in a first year postgraduate clinical pharmacy course should complete 12 months training in the wards of teaching hospitals under the supervision of the clinical pharmacy section in the ministry of health and pass the clinical exams, then continue their job in clinical pharmacy. The training course consists of theoretical and practical components set by the higher committee of clinical pharmacy in the ministry of health. The main domains for clinical pharmacy training and practice are:

- Appropriate medication therapy and medication treatment plan.

- Dispensing activities to ensure that the right drug in the right dose and right dosage form reaches the right patient in the right time.
- Monitoring outcomes and evaluation of patient's response.
- Medication review to evaluate medication-related problems.
- Health promotion and disease prevention activities,
- Communication with other health team members
- Patient-education to improve compliance to treatment.

The clinical pharmacy training program started in 1996 and so there are 21 courses till now completed with more than 1200 pharmacists graduated from it. One of the scientific jobs of the trainees is documenting their interventions made during their daily work of course the general country status has its own reflect on the clinical pharmacy practice, however, Iraqi clinical pharmacists are struggling to give the best clinical and best pharmaceutical care [26].

Methods

The purpose of this survey was to assess the role of clinical pharmacists in the medical team in Iraqi hospitals. A number of parameters were measured for this purpose; namely interventions made by first year clinical pharmacy trainees within the medical team during the 12 months training year 2017. In Iraq there are 22 training centers for clinical pharmacy, eight of them are in Baghdad which is the capital, while the other 14 are distributed all over the country one in each governorate. The 54 clinical pharmacists in the year 2017 were distributed in 20 training centers, as 2 training centers were not occupied.

This retrospective survey focused on 14 different types of interventions: administration, adverse drug reactions, allergy, contraindications, dispensing, dosing, drug disease interactions, drug food interactions, frequency of dosing, monitoring, resistance to drugs, patient adherence, storage, unavailability of drugs.

Data was analyzed using Microsoft Office Excel 2010.

Results

A total of 4049 interventions were collected and analyzed according to different parameters.

1. According to the type of intervention the drug-drug interactions had the highest score of interventions (40.973%), and then unavailability, dosing and monitoring. The least were drug food interaction, patient adherence and storage of medications (0.025% for each) as seen in table 1.
2. On the other hand, the highest interventions regarding dosage forms were made for vials (39.47%). Other dosage forms coming next were tablets (33.17%) then ampouls (15.73%). The other dosage forms are shown in table 2 showing that the least were eye ointments, nasal sprays, nebulizers and oral gels (0.02% for each).
3. As antibiotics compose a wide group of drugs that clinical pharmacists focus on their rational use, table 3 shows the percent of interventions done by the clinical pharmacists according to types of interventions as compared to all drugs. The total number of interventions regarding antibiotics done within this data was 1810. Drug-drug interactions were the highest in clinical pharmacist interventions (42.43%), after which came the unavailability (19.34%) and dosing (16.3%). The least were drug-food interactions, resistance, frequency, drug-disease interactions (0.06% for each), then patient adherence, and storage (0% for each). The comparison is shown in table 4 for all types of interventions.
4. The degree of focusing on types of interventions between antibiotics and all types of drugs is shown in table 5. The lowest the ratio between antibiotics and all drugs means that focusing on the type of intervention in antibiotics is higher. The lowest ratio was for unavailability of drugs, if we exclude patient adherence and storage which there as no data for the antibiotics group. This means that clinical pharmacists are highly aware about the unavailability of antibiotics and have a high intervention rate in choosing the most appropriate alternative to solve the problem of unavailability. Monitoring and contraindications are also of high concern to clinical pharmacists towards antibiotics.
5. Table 6 shows the ratios of comparison between the interventions according to dosage forms. Some of the data are so small so that it cannot be significant for comparison; therefore the very small data were not included in this comparison. Otherwise the higher the ratio means that interventions in that group within the antibiotics were higher. This is seen in the high ratios of suspensions and ointments, then vials, and the low ratios of suppositories and syrups.

Table 1: Interventions done for all drugs according to types

Type of intervention	Number	%
Administration	213	5.261
ADR	187	4.618
DD interaction	1659	40.973
Allergy	11	0.272
C/I	44	1.087
Dispensing	49	1.210
Dosing	412	10.175
drug disease interaction	3	0.074
drug food interaction	1	0.025
Frequency	2	0.049
Monitoring and outcome	291	7.187
Resistance	1	0.025
patient adherence	1	0.025
Storage	1	0.025
Unavailability	1088	26.871
Other	86	2.124

Table 2: Interventions done for all drugs according to dosage forms

Dosage form	Number	%
Ampoule	637	15.73
Bottle	64	1.58
Capsule	156	3.85
Cream	3	0.07
Drop	38	0.94
eye ointment	1	0.02
Inhaler	5	0.12
nasal spray	1	0.02
Nebulizer	1	0.02
Ointment	9	0.22
oral gel	1	0.02
Powder	3	0.07
Suppositories	31	0.77
Suspension	42	1.04
Syrup	116	2.86
Tablet	1343	33.17
Vial	1598	39.47

Table 3: Interventions done for antibiotics

Type of intervention	number	%
Administration	101	5.58
ADR	95	5.25
Drug-drug interaction	768	42.43
Allergy	11	0.61
C/I	15	0.83
Dispensing	22	1.22
Dosing	292	16.13
drug disease interaction	1	0.06
drug food interaction	1	0.06
Frequency	1	0.06
Monitoring and outcome	100	5.52
Resistance	1	0.06
patient adherence	0	0.00
Storage	0	0.00
Unavailability	350	19.34
Other	52	2.87

Table 4: Comparison between interventions between antibiotics and all types of drugs

Type of intervention	All	AB
Administration	5.26	5.58
ADR	4.62	5.25
DD interaction	40.97	42.43
Allergy	0.27	0.61
C/I	1.09	0.83
Dispensing	1.21	1.22
Dosing	10.18	16.13
drug disease interaction	0.07	0.06
drug food interaction	0.02	0.06
Frequency	0.05	0.06
Monitoring and outcome	7.19	5.52
Resistance	0.02	0.06
patient adherence	0.02	0.00
Storage	0.02	0.00
Unavailability	26.87	19.34
Other	2.12	2.87

Table 5: ratio of interventions between antibiotics and all other drugs according to types of interventions

Type of intervention	AB/ALL
Administration	0.47
ADR	0.51
DD interaction	0.46
Allergy	1.00
C/I	0.34
Dispensing	0.45
Dosing	0.71
drug disease interaction	0.33
drug food interaction	1.00
Frequency	0.50
Monitoring and outcome	0.34
Resistance	1.00
patient adherence	0.00
Storage	0.00
Unavailability	0.32
Other	0.60

Table 6: Ratio of interventions between antibiotics and all other drugs according to dosage forms

Dosage form	% ALL	%AB
ampoule	15.73	6.74
bottle	1.58	0.55
capsule	3.85	3.37
drop	0.94	0.99
ointment	0.22	0.39
suppository	0.77	0.00
suspension	1.04	1.82
syrup	2.86	0.33
tablet	33.17	19.50
vial	39.47	66.19

Discussion

This prospective observational study focused on the role of the clinical pharmacist in assessing drug related interventions in the medical team to resolve drug therapy problems and to provide better pharmaceutical care. During the round with the medical team all drug issues are discussed before the drugs reach the patient. Being the first study in Iraq to highlight the effects of pharmacists' interventions during their daily work in the ward with physicians, nurses, and patients, we collected this sample of interventions from clinical pharmacy trainees who are under full control of documenting most of their daily clinical activities. The study covered 12 months of 54 clinical pharmacist activities only. The duration of the study and number of interventions could be comparable with other studies in the same field, namely the Canadian study for 6 months with 1097 clinical pharmacist interventions [27]. If this study would have extended to document annual activities of all clinical pharmacists' activities in the country the clinical and financial benefits would be clearer.

If we compare with other studies in the same field, the interventions regarding dosing and frequency in this study (10.75%) are similar to that of Bronckhorst [28] (11%) whose data was concentrated on critical care units.

Drug-drug interactions are one of the main topics in the academic syllabus of pharmacy students; this could be one of the reasons for the high (40.97%) documentation of it. This can be noticed in the antibiotics group also (42.43%).

Other interventions showed close data between the all drugs' group and the antibiotics group. This can give an explanation that most pharmacists have almost similar concentration on drug problems regardless of their type. An exception was that our data obviated the fact that interventions regarding dosing of antibiotics were higher (16.13%), which highlights the fact that clinical pharmacists have high awareness about effect of dosing on antibiotic resistance. These data are in high synchrony with facts that clinical pharmacists are effect players in controlling multiple drug resistance diffusion and reducing healthcare associated costs as well as improving antimicrobial global management [29].

The problem of documentation of interventions had a clear effect on the whole data. The time of daily working is so crowded that many of the interventions are not documented.

There are parameters other than those studied in this research which are related pharmaceutical care such as time spent by clinical pharmacists in the ward which was studied by Bronckhorst [30], however, this was beyond the scope of our study.

Drug shortages and unavailability continue to be a problem for the health care team. The study showed that 26.871% of the interventions were focused on this topic. Of course clinical pharmacists suggest the appropriate alternative according to the patient's case. Data also showed that this activity regarding antibiotics is also high (19.34%). These data obviate that there is always shortage in different types of drugs which can only be solved by the clinical pharmacist's suggestions of the alternatives to reach the highest clinical outcomes for patients with the least medication errors and adverse events. Other studies showed a high rate of probability of medication errors (2.2%), adverse events (41.4%) and even deaths (1.1%) as well as the high institutional costs in cases of drug unavailability and shortages [31]. We also recommend, like other researchers [32], that the role of clinical pharmacists in this area be further studied.

Monitoring patient responses to treatment and to adverse events is a wide area for clinical pharmacists. This has been shown in the data for all drugs (7.187%) as well as for antibiotics (5.52%). Of course monitoring could be by a wide variety of clinical practices which was beyond the scope of our study; however, it is worth to be studied in further researches.

Dosing of drugs was also a wide area of interventions for clinical pharmacists; about (10.18%) for all drugs, and (16.13%) for antibiotics were in this group. This figure was much less than other studies (54.8%) [33], as they studied medication errors as a separate entity.

Drug-disease interactions, drug-food interactions, patient adherence, and storage were the least to have any interventions by clinical pharmacists. This could be either because these cases are less than the others, or because clinical pharmacists are not focusing on them in the same way of the other functions, or because they have little knowledge about this topic, or they have insufficient training, or they lack time for managing this issue [34]. Nazzari *et al*. have shown that the direct role of clinical pharmacists in this field has lead to a 13.1% decrease in drug-food interactions [35].

Monitoring and outcome showed a high rate of intervention in the clinical pharmacist work (7.187%).

This study also showed that weak points in the documented clinical practice were within the following points: drug disease interaction (0.074%), drug food interaction (0.025%), patient adherence (0.025%). These points have been stressed by other workers in the same field [36], however, the difference is that in our case the problem is with documentation of the activities.

The interventions regarding unavailability of drugs are associated with giving the most appropriate and available alternatives. The high percent of this activity (26.87% in the all drugs group, and 19.34% in the antibiotics group) gives an impression that clinical pharmacists have good communication with physicians and are aware about the whole clinical case as well as the available drugs in the hospital. Of course, all these activities have positive outcomes regarding patients. These activities have been studied from a different point of view by other researchers and so their results were different from ours. McLaughlin *et al*. studied the effects of drug shortages on patient care and found that 85.3% of the reported outcomes were alternative medicines [37]. However, in our study this case was a positive sign for improving the patient care and lowering the hospitalization period due to unavailability of drugs.

Interventions regarding dosage forms were also analyzed and showed that the highest interventions were within the vials, tablets, and ampoules in both all drugs (39.47%, 33.17%, 15.73% respectively) and antibiotics (66.19%, 19.50%, 6.74% respectively) groups. This could be due to the fact that these dosage forms correspond to most often used dosage forms and so the monitoring activities of clinical pharmacists are more focused on them.

Conclusion

Interventions made by clinical pharmacists are essential for choosing the most appropriate and available and suitable drug and dosage form for the patient in Iraqi hospitals. Patient safety and lowering hospitalization periods as well as improving the quality of pharmacotherapy and saving costs are goals that all health systems try to achieve, and so the close working of clinical pharmacists with the physicians in the ward and discussions regarding the use of drugs can help in achieving them.

Clinical pharmacists in Iraq have overcome many challenges during the last years since starting its application in hospitals and hence the above results were normally to be achieved, however, proactivity is more needed to reach higher results.

Recommendations

Being the first research in this field, and as this survey focused on interventions made by the first year clinical pharmacy program trainees only, it is recommended that further studies be designed to show the activities of all clinical pharmacists within their specialized fields to show the significance of interventions made and the most important disciplines that need their interventions.

Drug-disease interactions, drug-food interactions, patient

adherence, and storage need more attention of clinical pharmacists, and more work needs to be done in these fields.
Cost avoidance for intervention recommendations done by clinical pharmacists in Iraqi hospitals and accepted by prescribers need to be calculated in financial means and their effects on the quality of life.

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