ELECTRONIC DOCUMENTATION OF CLINICAL PHARMACISTS' INTERVENTIONS IN IRAQI HOSPITALS – A FOCUS ON PATIENT SAFETY

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ABSTRACT
Clinical pharmacy in Iraq started in the mid-eighties of the last century. Clinical pharmacists undertake a wide variety of activities which have a high impact on the rational use of drugs and hence increase the standards of patient safety. Documentation of these activities was essential in decision making regarding job description in different stages of application of clinical pharmacy services in health care settings. This was a descriptive study to review the electronic documentation of clinical pharmacist interventions during their daily work in Iraqi hospitals in years 2019-2020-2021. Results of this study showed the high difference between the manual and electronic documentation, in precision and simplicity of analysis, hence decision making would be more easy and patient safety would be higher.

INTRODUCTION
In the last few decades of the 20th century pharmacy practice world-wide started to shift from drug orientation to patient orientation and application of the principles of clinical pharmacy and pharmaceutical care.[1,2]

In Iraq, the clinical pharmacy program started to be applied in all hospitals since the last mid-nineties. The shifting of the clinical pharmacist's job to a multidisciplinary team was in gradual steps. The high collaboration with physicians and nurses was the corner-stone for the success in this field. The active participation in the medical round with physicians and the medicine distribution round with the nurse were considered as the most important activities to improve medication safety, reduction of medication errors, adverse drug events, and hence patient safety, as well as reduction in mortality rates, increase in the benefit/cost ratio and improvement in the quality of life and hospitalization periods and patient satisfaction.[3,4,5,6,7,8,9,10,11,12,13]

Documentation of activities and interventions of clinical pharmacists in their daily work is an essential element for clinical care, reconciliation, different types of interventions, risk management activities, clinical problem-solving, patient and nurse education. It also shows the impact of clinical pharmacist services and efficiency and quality of these services in the health care settings. Therefore, good documentation is one of the obligatory standards of practice to reach the final goal of the right therapeutic planning and assistance in patient safety and continuity of health care as well as evidence providing of clinical pharmacist professional input.[14,15,16] Unfortunately, because of different factors, these activities were documented in a scattered manner and hence were not published.

Digitalization of activities in health care settings is one of the tools for documentation in prescribing, dispensing, follow-up… etc. However, little data has been shown in this area, especially for activities of pharmacy practice in hospitals.[17,18,19]

It has been shown that clinical pharmacists used different means for their daily documentation which could be either manual or electronic.[20,21,22] As pharmacists are familiar with computer work and digitalization, some health systems have considered electronic pharmacist intervention documenting programs part of administration regulations.[23] Clinical pharmacists may use both electronic and paper documentation systems.

Benefits of electronic programs would be immediate, easy and accurate information documentation at any time of work, reducing paper work which is an obstacle in documentation and analyzing processes, and ensuring the right of the personal clinical pharmacist effort and work by documentation in his own account.

However, obstacles in this type of documentation is the lack of internet connection all time during work hours, and often stoppage in the program.

The Electronic Clinical Pharmacist Intervention Sheet (ECPIS) was an electronic program designed by the Information Technology (IT) center in collaboration with the Clinical Pharmacy Section in the Directorate of Technical Affairs in the Ministry of Health (MoH) to be used by clinical pharmacists and introduced in 2019. The design of the program was made to include all interventions made by clinical pharmacists for each patient in the hospital. It enables the clinical pharmacist to document easily, enables officials in the directorate of health (DoH) in each governorate to follow-up the activities of clinical pharmacists in hospitals within the governorate, and enables officials in the MoH to follow-up all clinical pharmacists' activities all over the country. Documentation of information should also comply with regulations of the MoH in the health institutes.[24,25]

Clinical Pharmacist Interventions encompass all activities that have an impact on patient management or therapy improvement and lead to safe medication use and hence patient safety. These could be seen as recommendations for alternatives, prevention of adverse events, activities regarding improvement in treatment of patients with the least harm to the patient and community. Examples could be duplication of drugs, interactions, lab interactions, contraindications, wrong drugs, incorrect dose or dosage form or strength, compliance problems, patient or nurse education issues, or allergies.[26,27]

Some studies have shown that clinical pharmacists do not complete their intervention documentations because of different causes,[28,29] and even only 72% to 50% of the interventions performed by pharmacists were recorded in different countries, showing that there is a large gap between the real work and the documentation.[30,31,32] Studies also show that more than 50% of pharmacy interventions were by mobile devices as they are more flexible and fast.[33]

AIM OF THE STUDY
This study aimed to evaluate the types of interventions made by clinical pharmacists for 3 years - 2019- 2021- in Iraqi hospitals with a focus on two DoHs in details, depending on the data already entered by clinical pharmacists in the electronic form (ECPIS), and to evaluate the types of interventions, and size of work, depending on using easy documentation by electronic programs.

METHODS
An electronic form (ECPIS) was designed which transfers the standard information concerning interventions made by the clinical pharmacist in all the day-work from paper-based work.
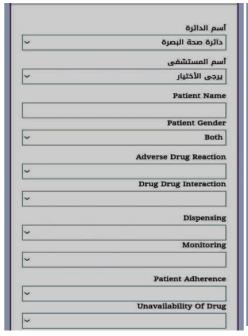
It took about 3 months for the design and reviewing of the form and the program between the senior pharmacists in the clinical pharmacy section in the MoH and the IT center to get the final version. The form was sent then to all clinical pharmacists in hospitals to be the standard of documentation.
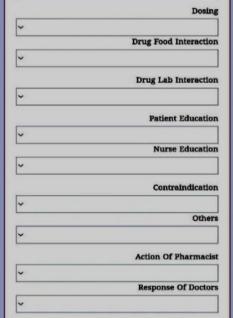
It consists of the following information: DoH, hospital name, clinical pharmacist name, patient name andgender, type of intervention (ADR, drug-drug interaction, drug-food interaction, drug-lab interaction, dispensing, monitoring, unavailability of drug, dosing, contraindication), acceptance from physicians, patient education, and nurse education.

Financial and technical risks of availability of laptops and computers were solved by making the program user-friendly by smart phones, android and iphones, especially during the rounds with the physician, as they are available for every clinical pharmacist. Making the program as web based made documentation easy as the majority of clinical have a 4G connection. Training of the users was made by educational videos made by the clinical pharmacy section in the MoH, as well as efforts made by clinical pharmacy sections in each DoH. Access to the information in the program was made in two levels; regional: in which responsible persons in the DoHs follow-up activities of documentation routinely according to the links of hospitals; and central: in which responsible persons in the clinical pharmacy section in the MoH can follow-up activities of all hospitals.

Each clinical pharmacist should create an account in the program before starting entering data. The account contains the name and location which are unique for each clinical pharmacist and could be followed-up by responsible persons.

Data entered uploaded within the ECPIS form were downloaded, extracted to the excel sheet and analyzed.

RESULTS

A total of 905282 reports were documented in the ECPIS in the 3 years (2019, 2020, 2021) from the 260 hospitals distributed in 17 DoHs in the country (except the Kurdistan region) as it is shown in table 1. The hospitals were of different sizes and specialties, however, all of them have clinical pharmacists in an average of 1 for each 20-25 beds. According to the skeleton of clinical pharmacy participation (1 clinical pharmacist for each 25 hospital bed) it is clear that the high number of reports from (Rusafa 17.72%, Medical city 17.05%, Karkh 39.78%, Najaf 8.69%, Basra 4.52%, and Diyala 5.89%) is related to the high number of clinical pharmacists in hospitals according to hospital beds and the numbers are proportional with the number of clinical pharmacists.

Table 1: Number of reports documented by DoHs.

DoH	Number of reports (2019 – 2021)	% Reports
Rusafa	160455	17.72
Medical City	154309	17.05
Karkh	360147	39.78
Najaf	78630	8.69
Diyala	53284	5.89
Basrah	40963	4.52
Anbar	17124	1.89
Babil	14438	1.59
Diywanyah	9021	1.00
Kirkuk	5894	0.65
Salahuddin	3362	0.37
Karbala	2201	0.24
Misaan	2040	0.23
Muthanna	1578	0.17
Wasit	1285	0.14
Thi-Qar	295	0.03
Ninawa	256	0.03
Total	905282	

Types of interventions were also analyzed from the documented data. The field of choosing the most appropriate alternatives to drugs that are not available in hospitals showed the highest percentage in reporting (23%), either because of shortages or formulary restrictions. Other fields of high reporting were dispensing (14.6%) and dosing interventions (5.5%) which can be a parameter of the high focus in clinical pharmacists' work, as well as interventions regarding monitoring (5.18%). Fields of little reporting were drug interactions (3.1%, 1.3%, and 1.04% for drug- drug, drug-food, and drug-lab respectively). The field of contraindications is shown to be the least in the size of work (0.37%)

Table 2: Types of interventions documented by all DoHs.

Types of interventions	2019-2021	%
Dosing	49807	5.501822
Unavailability of drugs	208974	23.08386
Patient adherence	107865	11.91507
Monitoring	46896	5.180264
Drug-food interaction	12033	1.329199
Drug-lab interaction	9468	1.045862
Drug–drug interaction	28746	3.175364
Dispensing	132164	14.59921
ADR	10447	1.154005
Contraindication	3415	0.377231
Total interventions	**609815**	
Others (not specified)	295467	32.63812
Total All	**905282**	

Reports of non-interventional activities, such as patient and nurse education, were also documented and reported to the program to be added to the database of clinical pharmacist activities. Table 3 shows that there was a high

reporting and documentation of patient and nurse education (1373584, and 1365098 respectively) which shows the high documentation rate, although not showing the real clinical pharmacists' work. This is one of the essential areas in which clinical pharmacists spend their daily work time. It is very clear that the time spent for each education case is not little, and this could be one of the causes that the reports are less than expected.

The positive response of physicians to clinical pharmacists' was also documented. The reports documented (187189) refer to the good relation and communication with physicians, by which rational useof drugs is improved with lowering of medication related problems and hence increasing patient safety.

Table 3: Non-interventional reports documented by all DoHs.

Non-interventional reports	2019-2021	Annual reporting per clinical pharmacist
Response of physician	187189	38.093
Patient education	1373584	279.52
Nurse education	1365098	277.8
Action of Pharmacist	308039	62.686
Total	**3233910**	

Types of intervention reports were different between the two DoHs studied in details. As it is clear from table 4 that the highest in both were regarding unavailability of drugs (33.6%, 24.8%, and 11% in Basra and 67.87%, 52.25%, and 32.75% in Karkh for the years 2019, 2020, and 2021 respectively); the activity of changing drugs during the round with physicians according to the most appropriate alternatives. This activity has its effect on patient safety in finding the most appropriate available

drug for the case to get the highest benefit with the lower cost and hospitalization period. Activities to increase patient adherence also were high in both DoHs (22.4%, 23.7% and 23% in Basra, and 5.92%, 5.55%, and 14.02% in Karkh for the years 2019, 2020, and 2021 respectively); this shows that clinical pharmacists have focused on this parameter to increase the awareness of patients to their medications and hence increase compliance which increase benefit and patient safety.

Table 4: Types of interventions documented by Basra and Karkh directorates.

	Basra							Karkh						
	2019	%	2020	%	2021	%	total	2019	%	2020	%	2021	%	total
Dosing	1580	19.4	2980	21.7	3450	18.0	8010	1183	4.49	2490	3.78	7173	2.68	10846
Unavailability of drugs	2740	33.6	3400	24.8	2110	11.0	8250	17880	67.87	34380	52.25	87763	32.75	140023
Patient adherence	1825	22.4	3250	23.7	4395	23.0	9470	1560	5.92	3652	5.55	37579	14.02	42791
Monitoring	1090	13.4	2370	17.3	3550	18.6	7010	964	3.66	3457	5.25	17205	6.42	21626
Drug-food interaction	150	1.8	330	2.4	350	1.8	830	241	0.91	795	1.21	5920	2.21	6956
Drug-lab interaction	120	1.5	360	2.6	330	1.7	810							
Drug-drug interaction	760	9.3	1860	13.5	3730	19.5	6350	1696	6.44	1866	2.84	4580	1.71	8142
ADR	464	5.7	630	4.6	1360	7.1	2454	1069	4.06	1670	2.54	9635	3.60	12374
Contraindication	50	0.6	35	0.3	60	0.3	145	56	0.21	9	0.01	241	0.09	306
Response of doctors	3390	41.6	5060	36.9	6407	33.6	14857	5060	19.21	6407	9.74	14857	5.54	26324
Number of reports	8145		13731		19087		**40963**	26345		65805		267997		**360147**

DISCUSSION

Electronic documentation has been found to give a more precise picture of the real work of clinical pharmacists in their different fields of activities. This is very clear when we compare the same area of work before and after the application of the electronic documentation. In 2017, it was found that 4049 reports were made by 54 clinical pharmacy trainees in 1 year as a paper work,[34] whereas in the same area and hospitals 905282 electronic reports were made by 1638 clinical pharmacists in 3 years,

which shows the big difference between paper and electronic documentation. The paper work is still preferred by some pharmacists who are not so friendly with electronic programs, similar to what is seen in countries such as New Zealand and USA.[35]

The high documentation reporting rate also showed the willing of DoHs to overview the real work of clinical pharmacists, and the spirit of competition for documentation between the DoHs played a role in

encouraging clinical pharmacists for documentation. Other factors affecting this rate were the new change from paper to electronic documentation, the somewhat simplicity of the program of documentation. However, besides the simplicity of entering data there was a complexity in viewing and exporting data by the responsible persons both in the regional and the central level because of the overloaded data, which ended at last with a shut-down of the program after 3 years.

The most common type of documentation was for unavailability of drugs and giving advice about the most appropriate alternative (208974 reports) which accounts for 23% of all reports. This activity is high because of reconciliation that clinical pharmacists do in their work as well as shortages in some medications in the hospitals or formulary limitations. It has also been seen that interventions about dispensing are of high concentration in clinical pharmacists' daily work which accounts for 14.6% of all reports. This difference is also seen between different governorates data in our study which shows that reports of unavailability of drugs in Basra (33.6%, 24.8% and 11%) were lower than Karkh (67.87%, 52.25%, and 32.75%), while reporting of dosing in Basra (19.4%, 21.7%, and 18%) were higher than Karkh (4.49%, 3.78%, and 2.68%). Differences could be due to differences in clinical practices between physicians and clinical pharmacists from hospital to another as well as differences in the specialties of hospitals.

Our data show that documentation of drug interactions, whether drug-food or drug-lab or drug-drug, was very low (1.3%, 1.04%, and 3.17% respectively), which was similar to other researches in the same area which means that there is either low occurrence or low attention to these parameters in general. The differences in reporting of these parameters between the two DoHs of Basra and Karkh give the same results. These areas are noticed to be of little focusing in clinical pharmacists' work and data in our study are comparable with other studies.[35]

The reports documented about contraindications were very low among the whole country (0.38%), and there was no difference in the reports of Basra (0.6%, 0.3%, and 0.3%) and Karkh (0.21%, 0.01%, and 0.09%). This could give an impression that contraindications are of the fields that physicians are aware about so that the interventions of clinical pharmacists would be of little benefit.

Patient and nurse education is one of the essential functions of the clinical pharmacist in the ward. Nurse education occurs mainly at the time of drug distribution to patients in the first dose time at noon. However, as clinical pharmacists stay in the ward during duty time, professional relationships grow and information about pharmaceutical properties of medications are discussed such as drug delivery, relation to meals, physical and chemical properties related to stability and interactions.

Patient education on the other hand starts as soon as the patient is admitted to the ward till discharge; reconciliation, medication history taking, as well as medication discharge form filling. Documentation of these activities shows the huge duties undertaken during the daily work time.

From the whole data we can notice that the documentation is still lower than expected according to the work load of clinical pharmacists. The data shows that only 184 reports are made by each clinical pharmacist annually. This can be justified if we put into consideration the rapid turnover of patients in certain wards, verbal discussions of interventions with negligence of the importance of electronic documentation especially if the documentation was written in the patient's file, and the internet on-off connection as well as periods of program stoppage. These are similar to other studies made in the same context.[36,37] As the Accreditation Council for Pharmacy Education (ACPE) Standards 2016 has concentrated on this point of using information technology in health care fields,[38] it will need more efforts to increase the awareness of clinical pharmacists for importance of electronic documentation.

Some of the obstacles faced with this program was the rapid turnover of the clinical pharmacists in their working places, which led to difficulties in real analysis of the reporting situation especially between DoHs.

CONCLUSION
Results from this study highlight
- The high capabilities and confidence of clinical pharmacists in Iraqi hospitals in the factors of rational drug use.
- The difference in documentation patterns between DoHs due to a wide range of parameters.
- Electronic documentation should be one of the important parameters of measuring clinical pharmacist activities. It is for the time being not mandatory, therefore only dedicated clinical pharmacists' reports are documented.
- The fact that encouraging and punitive policies regarding documentation lead to higher rate of reports.
- Technical factors, such as using smart phone applications instead of PCs, made the process of documentation easier and faster. On the other hand other technical factors such as low internet connectivity decreased the rate of documentation.

RECOMMENDATIONS
Further studies are needed to evaluate documentation of clinical pharmacists in Iraqi hospitals and its effect on rational use of drugs and medication safety in more details.

Conflict of Interest
"No conflicts of interest have been declared" for all

authors.

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