Clinical Pharmacist Role in Drug Information Services And Medication Errors Management At Tertiary Care Hospital

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Abstract*: Drug information service gains its importance as the development of new drugs and new diseases rising in no time and on other side the limited availability of health care resources to provide factual information in handling the new diseases and drugs. The aim of this study is to provide relevant information to the queries and evaluate the quality of the services provided. Prospective analysis was done for a period of 6 months in a south Indian tertiary care teaching hospital. We have interacted directly with health care professional to obtain queries and also communicated them with query boxes. In prospective analysis, A total of 108 queries were responded and identified 31 medication errors among them ,almost 65 % were rectified, 25 % were accepted but could not rectify as prescribers have justified the reason and remaining 10 % were not accepted as an error. 49 % of the requesters were appreciated with good; only 3% were advised to improve the quality. It was found that, the quality of the drug information service is "well accepted" and provides a great opportunity for further improvement with the involvement of more number of healthcare professionals.*
Keywords: *Drug information, Prospective, clinical pharmacist, Medication errors, Intervention.*

I. Introduction

Drug information service (DIS) is the service that encompasses the activities of specially trained individuals to provide accurate, unbiased, factual information, primarily in response to patient-oriented problems occurred from the healthcare teams [1]. Drug information is the provision of written and/or verbal information about drugs and drug therapy in response to a request from other healthcare providing organizations, committees, patients, and public community [2]. DI is also defined as the knowledge of facts acquired through reading, study, or practical experience concerning any chemical substance intended for use in diagnosis, prevention, or treatment of disease. It covers all types of information provision including subjective and objective information, as well as information gathered by scientific observation or practical experience [3]. WHO recognizes independent drug information centers as a core component of national programs to promote the rational use of drugs [2].

1.1 Types of DIC
1. Hospital based DIC: The hospital-based DIC perform various activities which include answering the in-house call, assist in formulary decision, participate in drug use evaluation, coordinate adverse drug reaction reporting, publishing newsletter, provide in service education, assist in Pharmacy and Therapeutic committee (P and T) committee, oversee investigational drug activity.
2. Industry based DIC
3. Community based DIC: Drug statistics
1.2 DIC – Resources: Pre-Computer Era

Resources can be categorized into
➢ Primary (journals)
➢ Secondary (indexing and abstracting)
➢ Tertiary (general reference books)

1.3 Origin of DIC [4]
In1962, at the University of Kentucky Medical Centre, the first drug information centre was started wh ich was intended to be utilized as a source of accurate, unbiased, selected, comprehensive drug information to c ater to the needs of the healthcare team. In Australia and the United Kingdom, the first drug information centres were established in 1968 at the Royal Melbourne hospital, Victoria and in 1969 at the London hospital respectiv ely. In India, Rosemary sharp, a missionary from UK, started the first drug information centre at christian

medical college, vellore in the early1970s. In India, the concept of rational drug use is yet a long way to go [5]. Irrational use of drugs is common and this has led to antibiotic resistance, adverse drug reactions, drug interactions and other drug related problems. Among the many factors that make clinicians unable to update their knowledge about drugs, lack of unbiased drug information, availability of more than 60,000 formulations and lack of time are few notable reasons which ultimately lead to an increasing demand for independent, specific and unbiased drug information for better patient care. [4]

Most of the developing countries suffer from lack of drug information due to limited availability of current literature, poor documentation and less dissemination of little information available.[6] Clinical pharmacists are referred as "Medicines Experts" and hence are well trained for this service. Provision of drugs and therapeutic information (DTI) to clinicians is one of the fundamental responsibilities of clinical pharmacists. However in the current scenario of health care system, DTI services are sounds to be necessary due to increased patient load with co-morbid conditions and availability of more number of drug molecules in the market and polypharmacy. Thus, provision of DTI helps practitioners to rationalize the therapy for their patients care. [7]

1.4 Role of clinical pharmacist in Drug Information Services (DIS) [8]
➢ Communicates information about the services available.
➢ Responds to queries accordingly to the degree of urgency.
➢ Maintains a documented system for recording details of the query & enquirer.
➢ Maintains documents for recording various responses to queries.
➢ Records the queries & their response references.
➢ Stores drug information service documents.
➢ Ensures the service is evaluated at regular intervals.
➢ Seeks regular feedback from users to ensure that the drug information service has been provided in a timely and satisfactory manner.
➢ Perform quality assurance of the information which has provided for improved quality of service.
Clinical pharmacist who is contributed to establishing Drug Information Services which is most useful for the prescribers and/or other healthcare professionals is termed as passive intervention.

We aimed to provide relevant information on the drug usage and to intervene any drug related problems to provide better patient care in tertiary care teaching hospital, RIMS, Kadapa with following objectives
➢ To evaluate Drug interventional services provided by clinical pharmacist in a tertiary care teaching hospital.
➢ To provide drug information by direct approach and query boxes and finding the efficacy ratio by feedback process.
➢ To identify and rectify DRP's with the suggestions of physicians.
➢ To analyze its benefits in optimizing quality and safety of medication use.
➢ To conduct the reactive and passive interventions.
➢ To evaluate the quality of drug information service provided.

II. Research Methodology
2.1 Study details
Place of study: The study "Evaluation of drug information services provided by clinical pharmacist at tertiary care   hospital", which was carried out in the Rajiv Gandhi Institute of Medical Sciences (RIMS), Kadapa.
Study duration   : 6 months
Study design   : Retrospective interventional and Prospective studies were done.
Sample size   : Prospective
Queries-108
Interventions – 31
2.2 Study Materials
2.2.1   A well structured Patient data collection form
2.2.2   Drug information query request form
2.2.3   Drug information response quality assurance evaluation form
2.2.4   Drug information feedback questionnaire
2.2.5   Pharmacists Intervention form

2.3 Method of study
• This prospective study was carried out by first making the awareness of this service to all the physicians, health care professionals and also others. Next step was the placement of query boxes in the wards of General medicine (MM-1 -4, FM-1-4), Pediatrics, dermatology, Psychiatry.

- Followed by reminding them about the study and collecting the queries from all the need (enquirer) through:
  - Direct access which is possible only by having good communication
  - Ward rounds along the health care team.
  - Query boxes which were placed in respective wards.
  - Telephone which is provided in DIC only for giving drug information services.
  - E-mail address written on the annexure forms.
- Thereafter, providing the required responses using the better drug information resources in time, this response was given by using annexure forms which are mentioned below. And this is followed by the collection of feed backs from the enquirers.
- This process is done along with the conduction of clinical reviews for the cases in order to check for any medication errors, drug related problems in order to intervene them.
- Thus both the responses from Drug information services and interventions were collected. The collected data is undergone for quality assurance which can be used for further result formation. There by the results are formed and categorized in different sectors like:

Type of Query
- Type of Enquirer
- Quality of response
- Mode of request.etc

And for interventions
- Type of Error
- Type of DRP
- Type of intervention
- Acceptance
- Severity of intervention.etc

III. Results
In this prospective study we have provided the drug information services and interventions were done for a period of 6 months.

3.1 Drug Information Services
A total number of 108 queries were responded during the 6 months period. A total of 108 queries were responded during that year, in that 23% were related to the drugs followed by disease 23%, and patient counseling 19%, treatment 16%, and others 19%. Mode of request was mostly through direct access 38.88% followed by ward rounds 35.18% and query box 25.92%. The purpose of the query was to update knowledge and for better patient care are 59.25% and 40.74% respectively, majorly nurses and physicians were the enquirers 24.07% and 23.14% respectively. Most of the people requested to give response within 1-2days are 73.14%, 49.03% of the requesters feedback was good and 32.4% feedback was excellent. 92.59% were having awareness on Drug information services which is represented in "Table 1"

Table1 Evaluation of Drug Information Services

S.No		Number	Percentage
1.	**Query Type**		
	Drug profile	25	23.14%
	ADR profile	05	4.62%
	Drug interaction	04	3.70%
	Dose/Administration	06	5.55%
	Pharmacokinetic	02	1.85%
	Pregnancy	03	2.77%
	Treatment	17	15.74%
	Patient counseling	20	18.51%
	Guidelines	01	0.92%
	Disease	25	23.14%
2.	**Mode of Request**		
	Direct access	42	38.88%
	Ward rounds	38	35.18%
	Query box	28	25.92%
3.	**Purpose of Query**		
	Updating knowledge	64	59.25%

	For better patient care	44	40.74%
4.	**Professional status of the Requester**		
	Physician	25	23.14%
	PG intern	21	19.44%
	Nurse	26	24.07%
	House surgeon/trainee	08	7.40%
	Pharmacist	23	21.29%
	Others	05	4.62%
5.	**Response Time**		
	Immediately(1-2hrs)	6	5.5%
	Within2-4hrs	5	4.62%
	Within a day	18	16.66%
	Within 1-2 days	79	73.14%
6.	**Requesters Feedback**		
	Excellent	35	32.4%
	Good	53	49.03%
	Satisfactory	17	15.7%
	Needs improvement	03	2.77%
7.	**Awareness on DIS**		
	Yes	100	92.59%
	No	08	7.40%

3.2 Interventions
Chart review was done randomly for the period of six months of our study and identified 31 medication errors.

3.2.1 Type of Error
We have observed that the 58% drug interactions in the prescription, followed by 12.90% Dispensing errors, 9.67% inappropriate drug selection, 9% were drug use without indication and finally 3.22% of errors were because of Adverse drug reactions & this is represented in "Table 2"

We have observed that 58.09 % of errors have reached the patients & 41.93% errors haven't reached the patients.

Table 2 Type of the Error

S.No	Type of Error	Number	Percentage
1.	Drug interaction	18	58%
2.	Dosage error	02	6.45%
3.	Inappropriate drug	03	9.67%
4.	Unnecessary drug	01	3.22%
5.	Prior ADR	01	3.22%
6.	Excessive duration	02	6.45%
7.	Others (dispensing ,allergies)	04	12.90%

3.2.2 Interventions Done
We have done the interventions for 20 prescriptions and recommended changing the drug (25%), change the duration (20%), and stop/hold the drug (20%), which is represented in "Table 3"

Table 3 Interventions Done

S. No	Intervention	Number	Percentage
1.	Change in drug	05	25%
2.	Change in dose	02	10%
3.	Stop/Hold the drug	04	20%
4.	Change Duration	04	20%
5.	Change Schedule	05	25%

3.2.3 Basis for Interventions
We have considered the prescriptions for interventions by observing the prognosis, past history, allergies etc, in that we found 15% each were not responding to the therapy and inappropriate drug to the patient condition, 40 % interventions were based on drug interactions, followed by 25% based on Literature review, and finally 5 % due to Prior ADR and are represented in "Table 4"

Table 4 Basis for Interventions

S.No	Type	Number	Percentage
1.	No response to treatment	3	15%
2.	Inappropriate drug regimen	3	15%
3.	Prior ADR	1	5%
4.	Literature review	5	25%
5.	Drug interactions	8	40%

3.2.4 Patient Population Involved in the Errors

We have observed that 51.6% geriatrics were affected, followed by 38.7% Adults and finally 9.67% pediatrics, which is represented in "Fig 1".
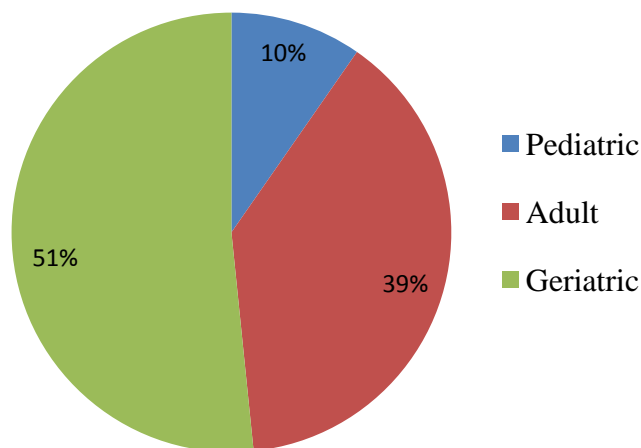
Figure 1 Patient Population Involved In the Errors

3.2.5 Significance of Interventions

It was found that 55 % of interventions were Moderate interventions, followed by 35 % were of Minor and finally10 % were Major and it is represented in "Table 5".

Table 5 Significance of Interventions

S.No	Significance	Number	Percentage
1.	Minor	7	35%
2.	Moderate	11	55%
3.	Major	2	10%

3.2.6 Ward wise Interventions

The results of number of interventions ward wise were found to highest in General Medicine (MM-39%, FM-23%), 19.35% of errors were from Psychiatry, followed by9.67% each from pediatric ward and surgical ward & is represented in "Fig-2".
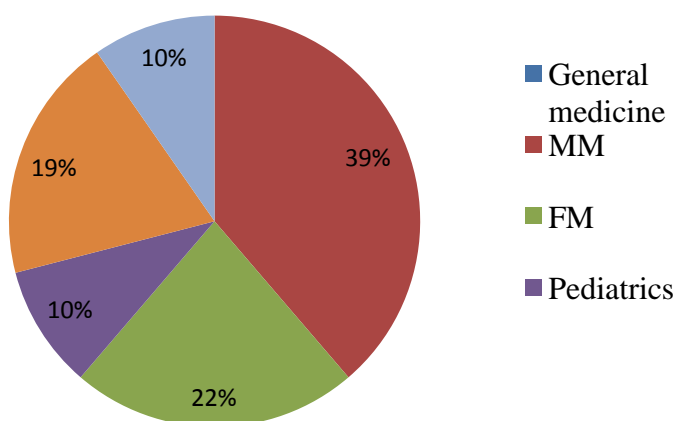
Figure 2 Ward Wise Distributions of Interventions Done

3.2.7 Professional involved in Error

Professional status involved in the errors, we found that 80.64% of errors were committed by Physicians/Interns, followed by 12.90% by Pharmacists and finally by6.45% were by nurses presented in "Table 6".

Table 6 Professional Status of the Person Involved in the Error

| S.No	Profession	Number	Percentage
1.	Physician/intern	25	80.64%
2.	Nurse	02	6.45%
3.	Pharmacist	04	12.90%

3.2.8 Reasons for the Error

Reasons for the error were estimated based on the professional status involved in the error and we have found that 48.38% of the errors are due to lack of knowledge, followed by 51.61% due to busy schedule/ heavy patients which is represented in "Fig-3".
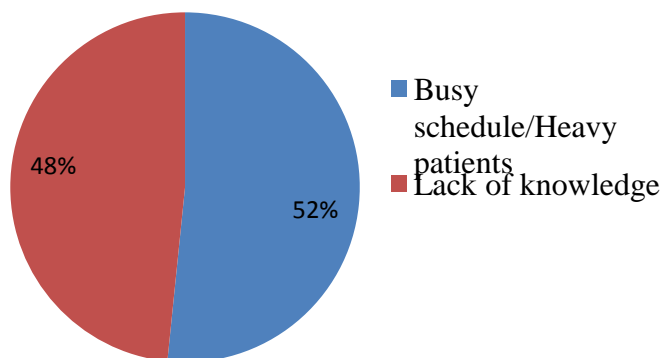
Figure 3 Reasons for the Error

3.2.9 Drugs Involved

From our study we have found that the 25.58% of errors were in Antibiotics & Anti Hypertensive prescriptions followed by18.60% of errors were in anti-psychotics prescriptions, 11.62% with NSAIDS prescriptions, 9.30% of errors were in anti-asthmatics prescriptions, 4.65% were in anti-coagulants with and finally 2.32% each of errors in anti histamines & anti-diabetics prescription and are represented in "Fig 4".
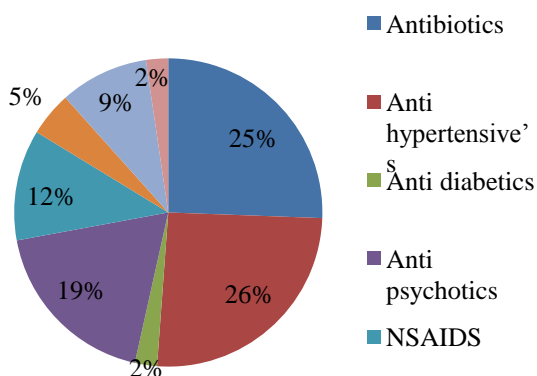
Figure 4 Drugs Involved in Medication Errors

IV. Discussion

A total number of 108 queries were responded during the 6 months period. This shows that there is need for drug information services. It was noticed that in that most of the query type, i.e. 23% were related to the drugs followed by disease 23%, and patient counseling 19%, treatment 16%, and others 19% this was similar to the results of the study conducted by Rohit Bhavsar et.al [3], Mode of request was mostly through direct access 38.88% which matches to the study by Jeevangi V M et.al [9], The purpose of requisition of most of the queries was to update knowledge 59.25% and for better patient care 40.74%. This is comparable with the study

conducted by Mudigubba Manoj Kumar et al [6], and opposite by Rekha MB et al study [10]. Majorly nurses and physicians were the enquirers 24.07% and 23.14% respectively which was supported by Ann Varsha Peter et al study [11] and contrast to Rajanandh M G et al study [4]. In this study, 73.14% are requested to give response within 1-2days which is similar to Jeevangi V M et.al [9] and Jayasutha J et al studies [12]. Majority of enquirers were very much satisfied with the performance of the service and rated as good (49.03%) and excellent (32.4%). Similar to the study conducted by Rohit Bhavsar et.al [3] and Walli et al studies [13]. By this study, it is clear that most of the health care professionals' i.e. 92.59% were having awareness on Drug Information services.Chart review was done randomly and identified 31 medication errors later intervention was done by clinical pharmacist. Majorly identified error was drug interactions 58% in the prescription, followed by 12.90% Dispensing errors, 9.67% inappropriate drug selection, 9% were drug use without indication and finally 3.22% of errors were because of Adverse drug reactions which is in contrast to the study findings done by Walleri Christini Torelli Reis et al.[14]

We have done the interventions for 20 prescriptions and recommended changing the drug (25%), change the duration (20%), and stop/hold the drug (20%). We have considered the prescriptions for interventions by observing the prognosis, past history, allergies etc, in that we found 15% each were not responding to the therapy and inappropriate drug to the patient condition, 40 % interventions were based on drug interactions, followed by 25% based on Literature review, and finally 5 % due to Prior ADR. It was found that 55 % of interventions were Moderate significant interventions, followed by 35 % were of Minor and finally10 % were Major. We have analyzed the ward wise intervention and found that the occurrence of errors is more in the General medicine ward 62% (MM 38.7%,FM 22.58%), followed by psychiatry 19.35% and especially Geriatric patients 51.6% were involved similar results were supported by Beveket molla Tigabu et al [15], Professional status of the person involved in the errors, we found that 80.64% of errors were committed by Physicians/Interns, followed by 12.90% by Pharmacists and finally by 6.45% were by nurses. In this study, reasons for the error were estimated based on the professional status involved in the error and we have found that 48.38% of the errors are due to lack of knowledge, followed by 51.61% due to busy schedule/ heavy patients

Finally we have observed that prescriptions with Antibiotics & Antihypertensives (51%) are highly involved in the errors supported by A.A.Al-Dhawailie et al [16] and Nrupal Patel et al [17], studies as there are so many drug -drug interactions are possible in these class of drugs and also duration of treatment should be properly prescribed because they may lead to adverse drug reactions, followed by anti-psychotics which shows many ADR's which was supported by Uday venkat Mateti et al study [18].

V. Conclusion

The study was carried out in an attempt to evaluate the quality of services provided by clinical pharmacists at Government Hospital. The study showed an active involvement of clinical pharmacists in the different wards.An innovative method- "drug information query box" was commonly utilized by the physicians, pharmacists and staff nurses and found it as easy mode of request.A quality assurance was done by the clinical pharmacist for the response of drug information queries which was "well accepted" and provides a great opportunity for further improvement with the involvement of more number of healthcare professionals.It was found that, the quality of the drug information service is "well accepted" and provides a great opportunity for further improvement with the involvement of more number of healthcare professionals.From this study it was concluded that, drug information service in the hospital was found to be beneficial for all health care providers as queries were based on mainly to update the knowledge which ultimately helps in better patient care only. This study also shows that drug information service provided by clinical pharmacists' was proved to be as a part of pharmaceutical care which involves the identification and rectification of medication errors. A future plan for the drug information queries from General Population and providing drug information services to them will helpful to increases the drug awareness amongst the society.

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