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## Assessment Of Clinical Pharmacy Services Provided by Pharm D Interns In A Tertiary Care Teaching Hospital

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### ABSTRACT

In India the clinical pharmacy services are yet at the infancy stage, very few private hospitals were adopted this system while these services are totally scarce in government hospitals. The aim of the study was to demonstrate the role and importance of clinical pharmacist and to assess the clinical pharmacy services provided. A Prospective analysis of the documented clinical pharmacy services performed by Pharm D interns were assessed for a period of 6 months. A total of 334 past medication history interviews, 333 patient counseling, 325 prescription auditing, 302 drug interactions, 55 medication errors and 23 Drug information queries were provided. Among 272 drug-drug interactions, 60.66% moderate drug-drug interactions and a least of 8.08% major drug-drug interactions and most common management plan recommended was dose adjustments (23.52%). Majority of the patients were counseled regarding the name and purpose of the prescribed medicines (96.39 %) and 34.83% reported barriers during their counseling. Among Past medication history interviews, 32.63% of patients had a history of medication intake. 59.38% of prescriptions were not prescribed drugs in their generic names. Maximum number of injections prescribed per prescription was three (20%), antibiotics per prescription were one (44.3%) and 91% of drugs were prescribed from the essential drug list. Of 55 prescribing errors reported majority of errors were belonging to category A (72.72%). It was found that 65.21% queries were to update the requestor's knowledge and 52.71% used primary sources to respond the queries. The study stresses impeccable role of clinical pharmacist in patient's care.

**Keywords:** PMH interviews, patient counseling, prescription auditing, drug interactions, medication errors, drug information queries.

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## INTRODUCTION

Pharmacy services in recent years have expanded significantly beyond drug preparation and distribution. These revolutionary changes have promoted greater involvement of the pharmacist patient care activities and drug related decision-making process. Clinical pharmacy has evolved as that specialization within pharmacy practice which deals with patient emphasis on drug therapy. This is a patient-oriented service and includes not only the dispensing of required medication but also advising the patient on the safe and effective use of medications. This concept of clinical or patient oriented pharmacy has gained tremendous acceptance in both hospital and community pharmacy practice due to its beneficial contribution to patient care. It seeks to promote much stronger pharmacist –patient relationships and closer interactions with physicians and other health professionals or personnel by integrating a significant number of patient-oriented services.<sup>1</sup>

Hepler has recently stated that “pharmaceutical care can be said to describe the original purpose of clinical pharmacy” and that the concept can be used to guide clinical pharmacy into working in a more coordinated and effective manner.<sup>2</sup>

In India the clinical pharmacy services are yet at the infancy stage, very few private hospitals were adopted the system in which clinical pharmacist provides the clinical pharmacy services, while these clinical services are totally scarce in government hospitals. So, government needs to improve the health care system by accepting the clinical pharmacy services thereby improving the healthy, professional relationship between the clinical pharmacist and the physician, nurses and other health care professionals reducing the drug related problems and other effects of the drugs.<sup>3</sup>

The pharmaceutical training has been outcome of the necessity to provide assistance to expatriate medical officers. India also faces several problems associated with medicines use. The path for continuous growth of the pharmacy profession obviously requires expansion, resurfacing and modernization. As the practice of pharmacy evolves, requiring more clinically oriented healthcare providers, Doctor of Pharmacy (Pharm D) programs expand their training to more hospital sites to expose students to the provision of safe, effective, and economic drug therapy to patients. The need for this form of patient care becomes is essential in managing chronic illness like diabetes, hypertension, and other cardiovascular disorders. In all these conditions, the diseases are usually lifelong and with a number of co-morbidities, making poly pharmacy part and parcel of the overall treatment strategy. The main objective is to maximize the clinical effects of medicines, i.e., using the most effective treatment for each type of patient; minimizing the risk of treatment-induced adverse events, i.e., monitoring the therapy course and the patient’s compliance with therapy trying to provide the best treatment alternative for the greatest number of patients Patient safety is one of

the most important aspects of health care system. Medicines can cure illness and at the same time harm the patient if not appropriately used. Hence every patient must receive the right medication, in the right amount and at the right time.<sup>4</sup>

A Clinical pharmacist can play a very important role by addressing the whole range of drug therapy in hospitals and, in general, the clinical pharmacy services have been reported to improve patient care by reducing inappropriate prescribing, improve disease management, diminish adverse drug events, reduce length of stay, ADRs and mortality and give economic benefit to a number of patients. Clinical pharmacists participate in ward rounds with physicians and provide their suggestions or recommendations wherever needed. The physicians prescribe medicines and the pharmacist checks the prescription to ensure rational use of drugs. They check whether there is an indication for the drug, is it the right drug/dose/duration/dosage/time, etc. If there is any deviation from these, they make appropriate interventions, inform the prescriber and document the interventions.<sup>5</sup>

Documentation of their interventions is important for justifying pharmacists' services to the patient, healthcare administrators and providers, patient care takers, to strengthen the profession and the society in total. These clinical interventions of pharmacists not only have a positive impact on patient care but also decreased cost.<sup>6</sup>

## MATERIALS AND METHOD

The study was carried out for a period of 6 months from October 2018 to March 2019 in Navodaya Medical College Hospital and Research Centre, Raichur. All the patients in the different departments of Navodaya Medical College Hospital, Raichur, Karnataka, were observed for a period of 6 months. Baseline data, demographic profiles and other relevant data were collected and reviewing the case sheets of included patients by the investigator. All interns were posted in different ward as a part of their internship and were requested to submit the details of clinical pharmacy services to the investigator to assess the clinical pharmacy services. Following completion of the ward-based data-collection period, analysis of the documented clinical pharmacy services was performed to assess clinical pharmacy services provided in various department.

### **Inclusion criteria:**

- Case details of all inpatients of either gender of any age group undergoing treatment in the inpatient wards of the hospital were included in the study.
- Patients admitted on day of sampling.
- Clinical Pharmacy Services carried out by Pharm D interns.

- Clinical Pharmacy Services documented and reported during the study period.

**Exclusion criteria:**

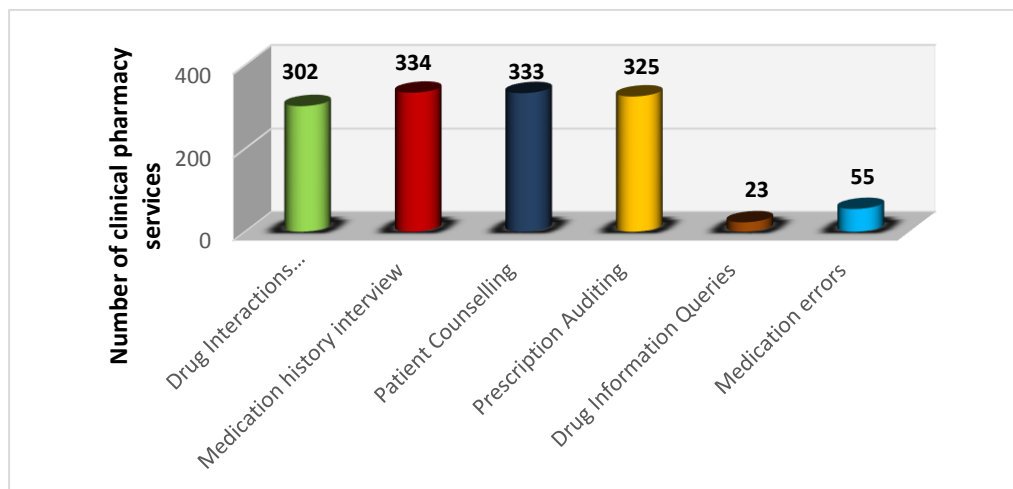
- Clinical Pharmacy Services documented before or after the study period.
- Clinical Pharmacy Services documented by Clerkship students.

**RESULTS AND DISCUSSION**

In this study out of 338 patients, 61.24% were females and 38.75% were male diagnosed with various disease conditions in different ward. Age was taken into consideration by dividing into seven age groups being kept at an interval of 10 years of each. Maximum number of patients were found in the age groups of 21-30 young adults (18.63%) and 31-40 middle aged adults (18.63%) and least were found in the age group of adolescents (8.28%). Most of the patients were illiterates with a percentage of 61.53 and remaining 38.46 % were literates. This shows that illiteracy is related with a low level of awareness, treatment and control of various disease conditions with greater importance of educational interventions to the patients. In this study majority of the patients didn't have any sorts of social habits. i.e. about 78.40% and there were only 21.59% of patients who have social habits. Among that 8.87% were alcoholic followed by 7.1 % of smokers and a least of 5.62% of tobacco users belongs to the category of others. This pattern of social habits may be because of majority of patients in this study were females.

The assessment of duration of stay in the hospital showed that 50% patients stayed in the hospital for 6 to 10 days followed by 36.99% for 3 to 5 days and least were 3.55% for 1 to 3 days. This may lead to poly pharmacy, medication errors and further drug related problems. This indicates the necessity of auditing of prescriptions and reporting the medication errors etc. thus, to promote the rational drug therapy. Majority of the patients i.e. about 47.92% were enrolled from the general medicine, followed by 22.78% from OBG, 16.56% from pediatrics, 7.98% from ortho and the least 4.3% were from the surgery.

**Figure 1** reveals the overall clinical pharmacy services provided during the study period. A total of 1372 clinical pharmacy services were provided by Pharm D interns which includes 334 PMH interviews (24.96%), 333 patient counseling (24.88%), 325 prescription auditing (24.28%), 302 drug interactions (22.01%), 55 medication errors (4.11%) and 23 drug information queries (1.71%).



**Figure 1: Details of clinical pharmacy services performed**

In this study it was assessed that 302 drug interactions were documented during the study period. Among that 272 drug-drug interactions and 30 drug-food interactions were found. 60.66% moderate drug-drug interactions, 31.35% minor and a least of 8.08% major drug-drug interactions as illustrated in Table 1. Drug interaction is the major factor that might cause ADR, therapeutic failure and drug related harm to the patients as drug interactions can affect patients' clinical outcome, quality of life as well as contribute to unnecessary health care costs. It is very difficult to quantify how many of the identified DDI were known by the physicians, but assume that they were possibly unaware of the potential risk associated with certain combinations. The clinical relevance of a DDI is often categorized into two dimensions, i.e., the expected 'severity' of a patient's physical reaction to DDI and the documentation. In fact, the clinical effects of any DDI, regardless of how well it is documented, do not occur in every patient or at the same level of intensity. They depend on patient-related factors that usually require individual assessment. However, the study results showed that some patients would have suffered reactions from major DDI, but current clinical situation could not encourage us to excel our services. The categorization of drug- drug interactions based on mechanism of action. 46.32% of drug- drug interaction is due to the pharmacokinetic mechanism of drugs like absorption (17.64%), distribution (2.2%), metabolism (20.58%) and excretion (5.88%) where as 45.58% shows that interactions due to pharmacodynamic action such as synergistic (30.58%) and antagonistic effect (14.7%). The most common management plan found in this study for most of the DDIs was dose adjustments (23.52%); mainly lowering the dose of drugs, this is similar to the results reported by Bergk and colleagues [Bergk *et al.* 2004] and Kulkarni V *et al.*<sup>7,8</sup> 21.69% should monitor signs and symptoms, 17.64% monitor the laboratory parameters, 8.08% monitor patient response, should

change dosing interval 6.98%, and 9.19% avoid those drug combinations. 12.86% doesn't requires any management may be due to clinically insignificant interactions.

**Table 1: Details of Drug interactions monitored**

| <i>Drug -Interactions</i>         | <i>Number of interactions(N=302)</i> | <i>Percentage (%)</i> |
|-----------------------------------|--------------------------------------|-----------------------|
| <b>Drug-Drug Interactions</b>     | <b>272</b>                           | <b>90.06</b>          |
| Severity of interactions          |                                      |                       |
| Major                             | 22                                   | 8.08                  |
| Moderate                          | 165                                  | 60.66                 |
| Minor                             | 85                                   | 31.35                 |
| Drug-Food interactions            | 30                                   | 9.93                  |
| Mechanism of interactions (N=272) |                                      |                       |
| Pharmacokinetic                   | 126                                  | 46.32                 |
| Absorption                        | 48                                   | 17.64                 |
| Distribution                      | 6                                    | 2.2                   |
| Metabolism                        | 56                                   | 20.58                 |
| Excretion                         | 16                                   | 5.88                  |
| Pharmacodynamic                   | 124                                  | 45.58                 |
| Synergism                         | 84                                   | 30.88                 |
| Antagonism                        | 40                                   | 14.7                  |
| Unknown mechanism                 | 22                                   | 8.08                  |
| Management Recommended (N=272)    |                                      |                       |
| Dosage adjustment                 | 64                                   | 23.52                 |
| Monitor for signs and symptoms    | 59                                   | 21.69                 |
| Laboratory monitoring             | 48                                   | 17.64                 |
| Monitor for patient response      | 22                                   | 8.08                  |
| Change dosing interval            | 19                                   | 6.98                  |
| Avoid the combination             | 25                                   | 9.19                  |
| No management required            | 35                                   | 12.86                 |

Among 338 patients enrolled, 333 patients were counseled and educated regarding their disease condition and treatment. The educational intervention focused on strategies to address the factors associated with medication non adherence, improving patient's knowledge of medications, reassure the patients about possible side effects etc. Table 2 shows that majority of the counseling was given to the patients (75.6%) and remaining 24.32% counseled family members. This because the study included pediatric as well as geriatric population where the counseling for family members should be necessary from the perspective of developing family centered better patient care. The counseling time was limited to 5 to 10 min with an account of 89.78% and only 10.21% were counseled for 10 to 20 minutes. Majority of the patients were counseled regarding the name and purpose of the prescribed medicines (96.39 %) followed by signs and symptoms (84.08%), dosage and administration (78.97%), life style modifications (48.94%) and further information's like advice on missed dose (16.51%), potential side effects (11.11%), precautions to be taken

(20.42%), Importance of compliance (10.81%), Drug-food interactions (20.12%). The study shows that 34.83% reported barriers during their counseling period which mainly includes language (30.03%), lack of interest of patients (3.09%), and a least of 0.9% reported as lack of time. It was found that remaining 65.16% don't have any sort of barriers.

**Table 2: Details of Patient counselling performed**

| <b>Counseled members</b>    | <b>Number of members counseled(N=333)</b> | <b>Percentage (%)</b> |
|-----------------------------|---|-----------------------|
| Patient                     | 252                                       | 75.67                 |
| Family members              | 81  | 24.32                 |
| Others                      | 0   | 0                     |
| Duration of counseling      | Number of patients                        | Percentage            |
| 5-10 min                    | 299                                       | 89.78                 |
| 10-20 min                   | 34  | 10.21                 |
| > 20 min                    | 0   | 0                     |
| Barriers during counselling | Number                                    | Percentage (%)        |
| YES                         | 116                                       | 34.83                 |
| Language                    | 100                                       | 30.03                 |
| Lack of interest of patient | 13  | 3.90                  |
| Lack of time                | 3   | 0.9                   |
| Lack of counseling Aids     | 0   | 0                     |
| NO                          | 217                                       | 65.16                 |

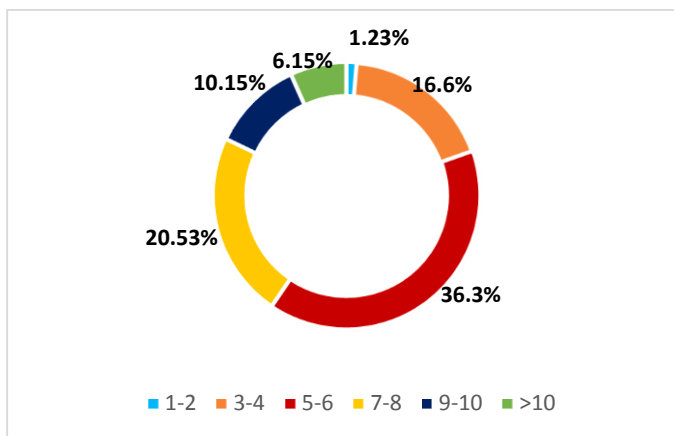
Table 3 reveals the result of past medication history interview, a total of 334 PMH interview was conducted and it was reported that 32.63% of patients had a history of medication intake. Among that 31.73% accounts for prescribed drugs, 1.49% had a history of OTC intake and a least of 0.59% had a history of herbal drug use. Remaining 66.76% didn't have any medications history.

**Table 3: Details of Past medication history interview conducted**

| <b>History of past medication</b> | <b>Number(N=334)</b> | <b>Percentage (%)</b> |
|-----------------------------------|----------------------|-----------------------|
| <b>Yes</b>                        | <b>109</b>           | <b>32.63</b>          |
| Prescribed drugs                  | 106                  | 31.73                 |
| OTC drugs                         | 5                    | 1.49                  |
| Others                            | 2                    | 0.59                  |
| No                                | 223                  | 66.76                 |

A total of 325 prescriptions were analyzed by prescription auditing. Figure 2 depicts the maximum number of drugs per prescription is 5 to 6 with a percentage of 36.3 and a least of 1 to 2 drugs (1.23%) which indicates the poly pharmacy. So, there is a need to decrease in the total number of prescribed drugs to the extent possible, so as to avoid the poly pharmacy that may lead to increased number of medication errors, side effects and increased burden on the patient and the government as a result of the increased cost of the therapy.





**Figure 2: Number of drugs per prescription**

**Table 4: Details of prescription auditing.**

| No. of drugs prescribed by generic name | No. of prescriptions(N=325) | Percentage (%) |
|---|-----------------------------|----------------|
| 0                                       | 193                         | 59.38          |
| 1                                       | 87                          | 26.76          |
| 2                                       | 27                          | 8.3            |
| 3                                       | 12                          | 3.69           |
| 4                                       | 3                           | 0.92           |
| 5                                       | 3                           | 0.92           |
| No. of drugs encounter with injection   | No. of prescriptions        | Percentage (%) |
| 0                                       | 43                          | 13.23          |
| 1                                       | 59                          | 18.15          |
| 2                                       | 50                          | 15.38          |
| 3                                       | 65                          | 20             |
| 4                                       | 45                          | 13.84          |
| 5                                       | 24                          | 7.38           |
| >5                                      | 39                          | 12             |
| No. of drug encounter with antibiotics  | No. of prescriptions        | Percentage (%) |
| 0                                       | 55                          | 16.92          |
| 1                                       | 144                         | 44.3           |
| 2                                       | 93                          | 28.61          |
| 3                                       | 17                          | 5.23           |
| 4                                       | 12                          | 3.69           |
| >4                                      | 4                           | 1.23           |

Table 4 shows that majority of the drugs were prescribed by brand name i.e. Drugs in 59.38% of prescriptions were not prescribed in their generic names. The percentage of drugs prescribed by generic name significantly very low. This reveals the importance of prescription auditing to prevent prescribing particular brands of drugs instead of their generics, may help to resolve the prescribing habits of physicians are being influenced by pharmaceutical companies and this will also facilitate to diminish unethical marketing strategies take up by some of the pharmaceutical industries. There is a need to implement the policy of generic prescribing in India, as it reduces the cost of the drug, both to the patient and pharmacies. Maximum number of injections prescribed per



prescription was three (20%) and more than 5 drugs encounter per prescription is least as shown in. The use of injectable should be reduced in developing countries so that the healthcare associated infections and blood borne pathogens can be prevented. Maximum number of antibiotics per prescription was one (44.3%) and a least of 1.23% prescriptions contains more than 4 antibiotics. It was found that 91% of drugs were prescribed from the essential drug list which is lower than the standard (100%) derived to serve as ideal. The reason behind this could be the lack of knowledge and awareness of EDL. The situation of rational drug use of drugs as per the WHO prescribing indicators was not up to the mark. Studying the prescribing pattern is that part of prescription audit which seeks to monitor, evaluate and if necessary, suggest modifications in the prescribing practice of medical practitioners, so as to make the medical care rational and cost effective.

**Table 5: Types of medication errors reported**

| Types of medication errors | No. of errors(N=55) | Percentage (%) |
|----------------------------|---------------------|----------------|
| Prescribing                | 55                  | 100            |
| Incorrect drug selection   | 4                   | 7.27           |
| Dose not mentioned         | 28                  | 50.9           |
| Frequency not prescribed   | 16                  | 29.09          |
| Therapeutic duplication    | 7                   | 12.72          |
| Administration             | 0                   | 0              |
| Dispensing                 | 0                   | 0              |
| Others                     | 0                   | 0              |

It was analyzed that as shown in Table 5, among the medication errors reported prescribing errors are the most common type. Similar finding was reported by different studies indicates prescribing errors as commonly perceived errors.

Out of 55 prescribing errors, omission of dose (50.9%) and frequency errors (29.09%) were the most frequently occurring errors. A least of 12.72% were therapeutic duplication and 7.27% were drug choice errors. The consequences of prescribing errors may lead to a reduced probability of effective treatment being timely or increase in risk of harm among the patients due to drug related adverse effects or drug interactions etc. Hence awareness among the prescribers and frequency audit of prescription to avoid medication errors is required.

**Table 6: Level of severity of reported medication error**

| Level of severity | Number of errors(N=55) | Percentage (%) |
|-------------------|------------------------|----------------|
| No error          | Category A 40          | 72.72          |
| Error, No harm    | Category B 7           | 12.72          |
|                   | Category C 8           | 14.54          |
|                   | Category D 0           | 0              |
|                   | Category E 0           | 0              |
| Error harm        | Category E 0           | 0              |
|                   | Category F 0           | 0              |

|              |            |   |   |
|--------------|------------|---|---|
|              | Category G | 0 | 0 |
|              | Category H | 0 | 0 |
| Error, Death | Category I | 0 | 0 |

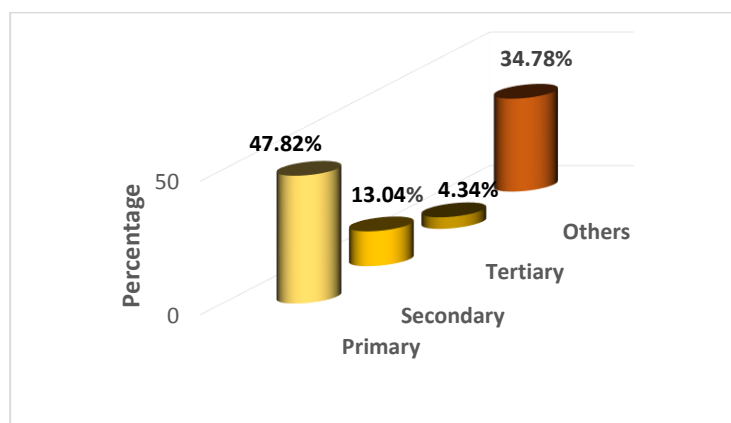
Table 6 depicts the severity level assessment of medication error where majority of belonging to category A, events have potential to cause error (72.72%), followed by category B, error didn't reach the patient (12.72%) and category C, error but no harm to the patient (14.54%). The reporting of the medication errors at right time by informing the staff who made errors may be the reason for those positive outcomes.

After analyzing the drug information queries from various department during the study period, the maximum number of queries received from department of general medicine (43.47%), followed by OBG (26.08%), Ortho (17.39%), surgery (8.69%) and least from pediatrics (4.34%) as shown in Table 7. The general physicians are dealing with the patients with multiple diseases and there is a maximum utilization of drugs. Hence may need more information regarding drug to update their knowledge. The direct access was the main mode of receiving the queries with a percentage of 78.26% as because Pharm D interns were posted in different wards through the day and the same was reported by Raal A et al and K R Das et al.<sup>9</sup> Though the main purpose of the drug information service is to improve patient care by optimizing the drug therapy but there was a steep hike in update the knowledge (65.21%) than that of better patient care (34.78%) in accordance with previous study report of Vijayakumar T M et al and K R Das et al.<sup>10</sup> However, updating knowledge will also ultimately lead to better care.

**Table 7: Details of drug information queries**

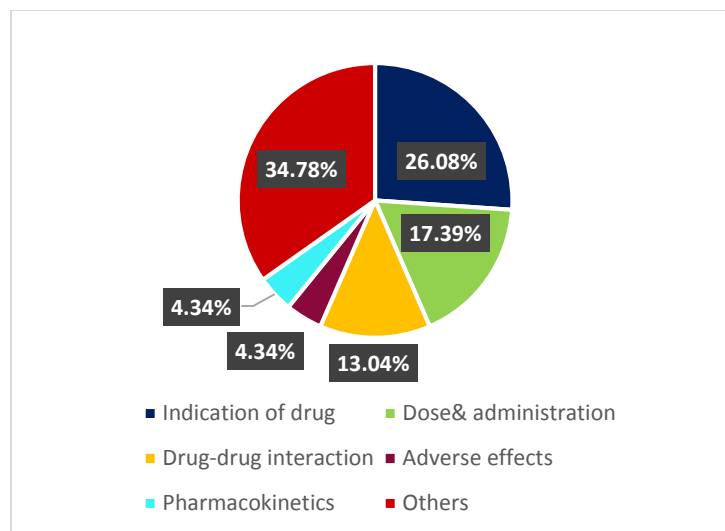
| Department of Enquirer | No. of Queries(N=23) | Percentage (%) |
|------------------------|----------------------|----------------|
| OBG                    | 6                    | 26.08          |
| Ortho                  | 4                    | 17.39          |
| Surgery                | 2                    | 8.69           |
| Gen.med                | 10                   | 43.47          |
| Pediatrics             | 1                    | 4.34           |
| Others                 | 0                    | 0              |
| Mode of Request        | No. of Queries       | Percentage (%) |
| Direct                 | 18                   | 78.26          |
| Ward Rounds            | 5                    | 21.73          |
| Email                  | 0                    | 0              |
| Phone                  | 0                    | 0              |
| Purpose of query       | No. of queries       | Percentage (%) |
| Better Patient Care    | 8                    | 34.78          |
| Update of Knowledge    | 15                   | 65.21          |
| Educational/ Academic  | 0                    | 0              |
| Time frame to reply    | No of queries        | Percentage (%) |
| Immediately            | 3                    | 13.04          |

|               |    |       |
|---------------|----|-------|
| Within a day  | 6  | 26.08 |
| Within a week | 14 | 60.86 |



**Figure 3: Distribution of reference sources used for response**

The data illustrated in Figure 3 shows that the primary sources (52.71%) such as original research articles, ongoing clinical trial reports etc. are most useful to respond the queries followed by secondary resources (13.04%) and others like internet sources (34.78%). Primary sources will provide more extensive and original information's that would be more useful to provide appropriate answers to the queries.



**Figure 4: Types of queries received**

According to categorization of the received queries, most number of queries were about the drug, its availability in market, disease, signs & symptoms etc. which are included in others (34.78%) followed by indication of the drug (26.8%), Dose and administration (17.39%), drug-drug interaction (13.4%), adverse effects (4.34%) and pharmacokinetics of the drug (4.34%). Most of the received queries were answered within a week (60.86%) and within a day (26.8%). Less

queries were answered immediately (13.4%) as illustrated in Figure 4. Almost all the enquirers received the appropriate answer within an acceptable time.

It is expected that lack of awareness and knowledge on importance of ward based clinical pharmacy services on improving appropriateness of prescribing could be one of the reasons for rejection of pharmacist interventions.

## CONCLUSION

This study shows the beneficial impact of clinical pharmacists' activities in a continually developing setting by describing various clinical pharmacy services. The clinical pharmacy services provided in various medical wards can contribute to a rationalization of drug therapy and therefore may lead to increased medication safety. Recognizing the gains accrued by the clinical pharmacist in patient care vertical and taking strategic strides so that there is at least one clinical pharmacist with every medical team is the need of the hour. The professional advancement of clinical pharmacy services has to be pursued to increase the continuity and professionalism of services, the quality of clinical pharmacy research and overall patient care. The study stresses the importance of clinical pharmacist in health care sector and impeccable role in patient's care.

## REFERENCES

1. Introduction to clinical pharmacy practice. In: Parthasarathy G , Hansen K.N, Nahate M.C.A textbook of Clinical pharmacy Practice . 2<sup>nd</sup> edition : Orient Blackswan ;2004:1-5.
2. Helper C and Strand LM. Opportunities and Responsibilities in Pharmaceutical Care. *Am J Hosp Pharm* 1990;47(3):533-43.
3. Mazhar M, Ansari A, Rajput SK. Clinical Pharmacy in India: Recent Advances and Perspective. *Pharmatutor* 2015;3(3):31-36.
4. Uday Venkat M, Rajesh V, Laddha A, Sharma S, Nagappa AN. Activities of Pharm D Students in Indian Hospital. *The Pharma review* 2011 :133-35.
5. Jamal I, Amin F, Jamal A, Saeed A. Pharmacist's interventions in reducing the incidences of drug related problems in any practice setting. *ICPJ* 2015;4(2):347-52.
6. Al-Rahbi HA, Al-Sabri RM, Chitme HR. Interventions by pharmacist in out-patient pharmaceutical care. *Saudi Pharm J* 2014;22:101-06.
7. Bergk, V., Gasse, C., Rothenbacher, D., Loew, M., Brenner, H. and Haefeli, W. (2004) Drug interactions in primary care: Impact of a new algorithm on risk determination. *Clin Pharmacol Therapeut* 76: 85–96.

8. Kulkarni V, Bora SS, Sirisha S, Saji M and Sundaran. A study on drug–drug interactions through prescription analysis in a South Indian teaching hospital. *Ther Adv Drug Saf* 2013; 4(4):141–46.
9. Raal A, Fischer K, Irs A. Determination of drug information needs of health care professionals in Estonia. *Medicina (Kaunas)*. 2006; 42: 1030-1034.
10. Das SK, Acharya S, Vijayakumar A and Gupta S. Drug Information Services as Pharmaceutical Care; Provided by Clinical Pharmacists' in a South Indian Government Hospital. *Austin J Pharmacol Ther* 2014;2(6):1-3.

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