Research Article

The Study on Assessment and Evaluation of Clinical Pharmacy Services in Paediatric Inpatients in Tertiary Care Teaching Hospital

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ABSTRACT

Clinical pharmacy has been defined as the services provided by pharmacists to promote rational drug therapy that is safe, appropriate and cost-effective. The volume of new drugs and the complexity of information associated with their use have made it very difficult for the medical profession to maintain expertise in drug therapy as well as disease state diagnosis and management. Pharmacists were thus a logical professional group to meet this clinical need and work with the medical practitioner to achieve safer and more effective use of drugs in patients, which consequently may result in better patient health outcome. This study mainly focuses on Provide drug information, Patient counseling, Monitoring ADRs and drug interaction, Identifying, and minimizing medication related problems in the pediatric ward. Totally 179 patients were enrolled based on the study inclusion and exclusion criteria. 14 drug information, 5 adverse drug reactions, 3 poison information and 134 patients counseling are given to the pediatric ward. Positively, we identified 179 drug related problems in the same ward. But there is no potential drug related problems in the pediatric ward.

Keywords: Clinical Pharmacy, Drug related problems, Paediatric patients and adverse drug reaction.

INTRODUCTION

Clinical pharmacy practice is concerned with the promotion of effective, safe and economical drug therapy. Pharmacy practice is a broader term which includes clinical pharmacy and other patient care-related activities performed by pharmacists in the hospital and community settings. These include dispensing and drug distribution, drug information, health promotion, patient counseling, Pharmacovigilance, drug interaction, Medication errors, medication reviews, drug related problems, medication adherence, academic detailing and sterile and non-sterile manufacturing. The primary focus of clinical pharmacy is the optimization of drug therapy in individual patients. Drug related problems occur at various levels of the medication use process and involve prescribers, patients, pharmacists, nurses, the pharmaceutical industry and the government[1]. Unlike the rapidly accelerating knowledge of that pharmacokinetic changes associated with development, little is known of the pharmacodynamic changes Assoc. The relatively stable pharmacokinetic profile of most drugs in adults and children's pharmacokinetics parameters change during maturation from neonates into adolescent. As a result the pediatric population diverse, dynamic group each aspect of drug disposition is affected, including absorption, distribution, metabolism and elimination none in this process fully matured at birth, and they develop at different over the first years of life. The study of these changes is known as developmental pharmacology[2]. Children are not little adults, but rather immature individuals whose bodies and organs are in a continuing state of development. It's not surprising, therefore, that the pharmacokinetics and toxicity of most drugs vary considerably throughout the pediatric age range and may differ profoundly findings in adults. Most children given drugs in hospital receive more than one and drug-drug interactions therefore need to be considered in prescribing[3]. Children are among the nation's most numerous users of prescription and cautions are taken for acute illnesses, many children also regularly take medications for chronic diseases such as asthma, diabetes, and various mental health disorders. According to the National Center for Health Statistics, 6.6 million children have had illnesses for which they took prescription medications for at least 3 months. Pediatric pharmacotherapy is further complicated by the fact that the majority of the drugs are lacking in the approval by the U.S. Food and Drug Administration (FDA) for use in children. In 1997 the National Institute for Child Health and Development states that 75% of all medications did not carry FDA-approved labeling for children and only 5% of the 80 drugs most commonly used in newborns and infants were labeled for pediatric use[4]. This greater focus on the improvement of the safety of drugs used in children is necessary. Clinical pharmacists can not only improve drug safety, but also serve to lower costs, improve quality of pharmacotherapy, coordinate the relationship of Pharmacy with other departments and enrich patient drug knowledge[5].

Clinical pharmacy is an expanding patient oriented hospital role with the potential for encroachment on the physician role. CP success hinges on the attitude of physicians towards the use of pharmacist in a clinical capacity[6]. Clinical pharmacist duties to record prospectively the frequency and potential harm caused by errant medication errors and also to assess the impact

of pharmacist interventions for preventing potential harm. The most common type of error is an incorrect dosage in an antibiotic class of drugs[7]. Several studies suggest that about one third of ADEs is associated with medication errors and are thus preventable[8]. Analysis of the origin of the errors has suggested that specific improvements in the medication ordering and processing system might reduce the risk of error[9]. Less information is available regarding the epidemiology, prevention of medication errors and ADEs in pediatric inpatient settings[10]. Errors in dosing (overdose or under dose) were the most commonly encountered adverse events[11].

Methodology

Objectives

➢ Provide drug information

➢ Patient counseling

➢ Monitoring ADRs and drug interaction

➢ Identifying and minimizing medication related problems

➢ Improving patient safety initiatives

Study type

It's a prospective and observational study. Patients were enrolled based on the inclusion and exclusion criteria.

Inclusion criteria

• All the inpatients of either sex of age between 2 months to 12 years for paediatric undergoing treatment in the inpatient wards of the hospital will be taken for the study

• Patients who are having past medical and medication histories also included in this study

Exclusion criteria

• Patients undergoing treatment less than one day of hospital stay they, are excluded from the study

• Those patients who are admitted in the paediatric surgery ward and neonatal care department, they are excluded from the study.

RESULTS

Table 1: Age wise distribution of study patients

SNo	Age limit	Number of patients		Total no. of patients (n=166)	Percentage (%)
		Male	Female		
1	2 months- < 1 year	19	06	25	1
2	1-3 years	43	27	70	2
3	4-6 years	19	09	28	3
4	7-9 years	08	07	15	4
5	10-12 years	17	11	28	5

Table 2: Number of medications Vs Formulation used on PD admission

S. No	Number of drugs	No. of patients (n=166)	Percentage (%)
1	1-4	119	71.68
2	5-8	40	24.32
3	≥ 9	01	0.6

S. No	Types of formulations	No. of patients received (n=166)	Percentage (%)
1	Syrup	119	71.68
2	Injection	105	63.5
3	Nebulization	27	16.26
4	Tablet	65	39.15
5	Capsules	0	0
6	Other routes	100	60.24

Clinical Pharmacy Services

Table 3: Types & No. of Clinical pharmacy services provided

S. No	Services	No. of Clinical pharmacy services (n=156)	Percentage (%)
1.	Drug information	14	8.97
2.	Adverse drug reaction	05	3.20
3.	Poison information	03	1.92
4.	Patient counseling	134	85.89

Drug Information Services

Table4: Category of Drug information queries

S. No	Category	No. of queries (n=14)	Percentage (%)
1.	Drug therapy	03	21.42
2.	Dose administration	01	7.14
3.	Drug interaction	02	14.28
4.	ADR's	02	14.28
5.	Poison information	01	7.14
6.	Others	05	35.71

Adverse Drug Reaction

Table 5: Medication implicated Predictability of ADR's

S. No	Drug Name	No. of ADR's (n=5)	Percentage (%)
1.	Phenytoin	2	40
2.	Polio vaccine	1	20
3.	Salbutamol	1	20
4.	Erythromycin	1	20

S. No	Predictability	No of ADR's (n=5)	Percentage (%)
1.	Predictable	2	40
2.	Unpredictable	3	60

Drug Interaction

Table 6: Severity of drug interaction

S. No	Severity	No of drug interaction (n=35)	Percentage (%)
1.	Serious	1	2.85
2.	Significant	16	45.71
3.	Minor	18	51.42

Drug Related Problems

Table 7: Demographical details of patients in whom the drug related problems are identified

Characteristics		Number	Percentage (%)
Sex	Male	57	64.77
	Female	31	35.22
Age limit	Number of DRP's (n=179)	Percentage (%)	
2 months-<1 year	22	12.29	
1-3 years	72	40.22	
4-6 years	31	17.31	
7-9 years	18	10.05	
10-12 years	36	20.11	
Co-morbidities	No. of patients (n=166)	No. of DRP's	Percentage (%)
0	141	171	95.53
1	15	08	4.46
2 and more	0	0	0

Table 8: Impact of clinical pharmacist imitated changes in drug therapy

S. No	Clinical Significance of Interventions	Number (% of total) N=179
1.	Life saving	0
2.	Major (Intervention is expected to prevent or address "very serious" drug related problems defined as greater than 20% chance of noticed effect or greater than 5% chance of harmful effect)	1 (0.55)
3.	Moderate (Adjustments expected to enhance effectiveness of drug therapy, producing minor reductions in patient morbidity, or a less than 20% chance of noticed effect)	2 (1.11)
4.	Minor (Small adjustments and optimizations of therapy, not expected to significantly alters hospital stay or clinical outcomes)	18 (10.05)
5.	No clinical significant	158 (88.26)

DISCUSSION

Clinical pharmacy services are not a regular practice in most of the hospitals in India but it is a newborn emerging discipline. With the intention of expanding the roles and services of clinical pharmacist in providing better patient care, drug information, patient counseling,

ADR's monitoring and reporting and drug therapy monitoring in hospital we carried out this study[12].

A total of 166 pediatric patients were included in the study. All those who were included in the study were from 2 months to 12 years. In the study out of 166 patients 42.17% of patients were in age group of 1-3 years, 16.88% of patients were in age group of 10-12 years, 16.87% of patients were in age group of 4-6 years, 15.06% of patients were in age group of 2 months to less than 1 year and 9.04% of patients were in age group of 7-9 years (Table: 1).

Among in 166 patients 52.41% of pediatric inpatient's length of hospital stay was less than 3 days, 37.35% of patient's length of hospital stay was in between 4-6 days, 7.83% of patient's length of hospital stay was in between 6-10 days and 2.41% of patient's length of hospital stay was greater than 10 days.

Among 166 pediatric inpatients 71.68% patients received in between 1-4 drugs, 24.32% of patients received in between 5-8 drugs and 0.6% of patients received ≥9 drugs (Table: 2). In this 84.93% of patients (out of 166 inpatients) were not having co-morbidities, 9.03% of patients were having 1 co-morbidity and no two or more co-morbidities were identified in the study populations. Out of 166 inpatients 40.36% of patients received three different types of formulations, on the way 29.51% of patients received two different types of formulations, 15.06% of patients received four and more different types of formulations and 12.65% of patients received only one formulation. Followed by 71.68% of patients received syrup formulation, 63.5% of patients received injection, 39.15% of patients received tablet formulation, 16.26% of patients received nebulization, 60.24% of patients received other formulations and no patients received capsule (Table: 2).

Totally 586 drugs were used in 166 pediatric inpatients. In anatomical class of drugs 33.27% of drugs belong to central nervous system, 19.11% of drugs belong to gastro intestinal system, 5.80% of drugs belong to respiratory system, 2.21% of drugs belong to immune system, 0.68% of drugs belong to cardiovascular system and 38.9% of drugs belong to other systems (Table: 5). Therapeutic and pharmacological classification. That's clearly expressed that 30 therapeutic classes of drugs were used in pediatric inpatients. In that analgesic & anti-pyretic (17.06%), antimicrobials (21.16%) and anti-histamines (6.65%) are mostly used in paediatric department. Followed by 53 pharmacological classes of drugs were used in pediatric inpatients. With these 53 pharmacological classes majorly Cox inhibitor, third generation cephalosporin, selective 5HT3 inhibitor, selective beta 2 agonist and benzodiazepines are used.

Out of 156 clinical pharmacy services 85.89% of services were provided in patient counseling, 97% of services were provided in drug information, 3.20% of services were provided in ADRs and 1.92% of services were

provided in poison information (Table: 3). Totally 156 clinical pharmacy services were initiated by physician (46.15%), postgraduate (30.12%), intern (13.46%), nurse (5.76%), others (4.48%).

Among 14 drug information queries 21.42% of DI queries were related to drug therapy, 14.28% were related to drug interactions and ADRs, 7.14% were related to dose administration and poison information, 35.71% were related to other types of drug information queries (Table: 4). Purposes of drug information queries were analyzed. 35.71% of DI queries were provided to update knowledge. In this 28.57% of DI queries were provided for better patient care and 35.71% of DI queries were provided for better patient care and update of knowledge.

Out of 14 DI queries 50% DI queries were received from physician, 21.42% were received from postgraduate, 14.28% were received from nurse, 7.14% were received from intern students and 14.28% were received from other types of health care providers. Out of 14 DI queries 57.14% were answered within 2-4 hours, 21.42% were answered within 24 hours, 14.28% were answered immediately and 7.14% were answered when time permitted. Among 14 queries 57.14% of DI queries were answered by referring primary, secondary, tertiary drug information resources, 35.71% were answered by referring secondary, tertiary resources and 7.14% were answered by referring tertiary resources.

Among 179 drug related problems 5 ADRs were identified in the study. Of 166 patients 2 patients developed maculo popular rashes after taking phenytoin.

Another patient developed papular rash after taking polio vaccine and the third suffered from palpitation after taking salbutamol and the fourth patient developed rashes after taking erythromycin.

The four patients recovered after discontinuing these drugs and one patient also recovered after the treatment. For assessing the predictability of ADRs, 2 ADRs were found to be predictable and 3 ADRs were unpredictable. The preventability rates of ADRs were found to be 100% (Table: 5).

During the study period 134 patients were counseled among 166 patients. 21.64% of patient's care takers were counseled about respiratory disorders, 17.16% of patient's care takers were counseled about seizures, 11.94% of patients were counseled about acute gastroenteritis, 6.71% of patients were counseled about urinary tract infection, 5.22% of patients were counseled about scrub typhus, 1.4% of patients were counseled renal calculi and 35.82% of patient's care takers were counseled about other diseases in pediatric patients admitted during the study period. 43.75% of patient's care takers were not counseled due to patient based barriers, 34.37% due to system based barriers and 21.87% due to provider based barriers among 32 patients.

Of 35 drug interactions 51.42% of drug interactions were found to be minor, 45.71% was found to be significant and 2.85% was found to be serious (Table: 6). The most common drug class implicated in drug interaction was vitamin supplements (14.20%).

Out of 179 drug related problems 64.77% of DRP's were identified in males and 35.22% of DRP's were in females. More number of DRP's was identified in age group of 1-3 years (40.22%). Among 166 patients 63 patients were having drug related problems (Table: 7).

The most common drug class implicated in drug related problems was third generation cephalosporin (22.8%) and the least common drug classes implicated in drug related problems were glucocorticoids (1.75%), short acting corticosteroid (1.75%), macrolides (1.75%), aminoquinoline (1.75%) and H_1 receptor antagonist (1.75%).

The impacts of clinical pharmacist imitated changes in drug therapy were observed on study population.

In that the number of clinical significance of interventions are lifesaving 0.55 %, major 2.79 %, moderate 1.11 %, minor 10.05 % and no clinical significance are 85.47 % (Table: 8).

Rainu kaushal concluded that the development and testing of medication error reduction interventions is important in pediatrics and to reduce the rates of potential and preventable ADEs in pediatrics, the most effective interventions are likely to be computerized physician order entry with integrated clinical decision support and full-time, ward-based clinical pharmacists which coincides with our study that assessment and evaluation of drug related problems through clinical pharmacy services are important for pediatric patients.

CONCLUSION

Overall the study concludes that clinical pharmacists play a key role in the patient safety initiatives, intercepting and acting against on possible prescribing errors.

In particularly paediatric department, it's a mountain important for educating and guiding the health care professionals related to safety use of medications. Even though drug related problems were identified it was not harmful to the patient.

Finally the service created a more impact on therapeutic decision making and drug therapy in paediatric department.

In future the clinical pharmacy services will be continued to neonatal care for better patient care in the hospital.

REFERENCES

1. G Parthasarathi, Karin nyfort-hansen, Milap C Nahata. A textbook of clinical pharmacy practice, second edition, Indcom Press, India, 2012, 2-18.

2. Leon shargel, Alan H. Mutnick, Paul F. Souney, Larry N. Swanson. Comprehensive pharmacy review, seventh edition, Wolters Kluwer, India, 2010, 38-42.

3. George Rylance, Clinical pharmacology, British medical journal., 286, 1981, 50-51.

4. Frank D. Dundee, Dominic M. Dundee, and David M. Noday, Pediatric counseling and medication management services: Opportunities for community pharmacists, Journal of the American pharmaceutical association., 42, 2002, 556-567.

5. Chuan Zhang, Lingli zhang mail, Rong Luo, Jin Wen, Clinical pharmacists on medical care of pediatric inpatients: A single-center randomized controlled trial, Public library of science., 7, 2012, 56-61.

6. Ferris J. Ritchey, Marilyn R. Raney and Thomas D. Keith, Physicians' opinions of expanded clinical pharmacy services, American journal of public health., 73, 1983, 96-101.

7. Hugo L. Folli, Robert L. Poole, William E. Benitz, Janita C. Russo, Medication error prevention by clinical pharmacists in two children's hospitals, Official journal of the American academy of pediatrics., 79, 1986, 718-722.

8. Bates DW, Cullen D, Laird N, Incidence of adverse drug events and potential adverse drug events: implications for prevention, JAMA., 274, 1995, 29-34.

9. Leape LL, Bates DW, Cullen DJ, Systems analysis of adverse drug events, JAMA., 274, 1995, 35-43.

10. Folli HL, Poole RL, Benitz WE, Russo JC, Medication error prevention by clinical pharmacists in two children's hospitals, Official J of the American Academy of Pediatrics., 79, 1987, 718-722.

11. Condren ME, Haase MR, Luedtke SA, Gaylor AS, Clinical activities of an academic pediatric pharmacy team, Annals of pharmacotherapy., 38, 2004, 574-578.

12. Satish Kumar BP, Prasanna Dhalal, Rajesh Venkataraman, Prashant Chandra Fuloria, Assessment of Clinical Pharmacist Intervention in Tertiary Care Teaching Hospital of southern India, Asian journal of pharmaceutical and clinical research., 6, 2013, 258-261.

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