

Patient Safety and Erroneous Medication in Healthcare Organisation : A Learning Lesson

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Abstract- Objective : The ultimate goal of drug therapy is to achieve predetermined therapeutic outcomes which improves a patient's quality of life while minimizing patient's risks which may be known or unknown. The incidents and hazards which results from such risk have been defined as medication errors. The need of study of medication error was felt to study prevalence of medication errors, to estimate the present magnitude and sensitise concerned staff to prevent these errors.

Methods : Prospective study was conducted at multispecialty tertiary care hospital for a period of four months to collect data regarding all incidences of medication errors occurred during the hospitalization of patients. The study population was employees of the hospital who were involved in patient medication. All medication errors occurred during study period were analysed to find out root cause and all related data were captured.

Results : During the study period total of six hundred eighty five patients were observed for any medication errors of any kind and relevant data was collected. From collected data following types of medication errors were detected and taken in to consideration. Based on demographic status of the patient who encountered medication error during their hospitalization duration male patients 68.75% while female patients were 31.25%. Out of sixty four medication errors during study period the omission error was in 28.12% cases. Maximum errors 28.12% were detected in the month of June and minimum 20.31% in September. Majority of medication errors were due to antibiotics 21.87% followed by NSAIDs 18.75%. During the study it was also found that four patients had medication errors more than one time. one patient faced medication errors Three times while other three patients encountered medication errors twice.

Conclusion: The outcome of study showed that medication error was found to be 9.3% seems not quite high however aim of study was to sensitise the concerned staff members involved in patient care about the errors in the vital part of the patient management and if not vigilant the incidence may get higher and lead to life threatening event.

Index Terms- Drug Therapy , Hazards, Hospitalised Patients, Incidence , Medication Errors, Outcome

I. INTRODUCTION

The goal of Medication to the patient is an integral part of the patient care and is done so as to achieve defined therapeutic outcomes which improves a patient's quality of life while minimizing patient's risks whether known or unknown ,

associated with therapeutic use of drugs and other pharmaceutical agents. the incidents and hazards which results from such risk have been defined as adverse drug misadventures which includes medication errors. (1)

The subject of Medication errors has received more national and international recently in view of patient safety and accreditation quality management process and system. The medication administration errors were used by researchers studying the quality of the output of drug distribution system back in 1960's when the unit dose drug distribution system was being developed and this was it is considered as any deviation from the prescriber's written order or as entered in to a computer system by the prescriber

Medication error is defined as ' The failure of a planned action to be completed as intended or use of a wrong plan to achieve an aim.'(2) **it can also be defined as** ' Any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional , patients and consumer' (3)

These events may be related to the professional practice , healthcare product and procedures as well as system. The iatrogenic injuries which are resultant of medication errors are world wide well known phenomenon and is common, costly and clinically important. In 1990 Richard Clark published the very first study which looked at error rates in clinical diagnosis. Since then several studies have looked in to medication errors which is going to continue to be a problem in healthcare industry. It is estimated that the annual cost of drug related morbidity and mortality is nearly \$177 billion in USA. Though the exact data in India is not available however approximately 7,000 deaths occur each year and medication errors occur in one every five doses of medication given in the hospital. There is at least one death occur each year per day and 1.3 million people are injured each due to medication errors (4)

Incidence rate of medication errors among admitted to hospital is about 28% and hence are very much preventable. (5)

Medication errors increase cost , significantly prolong hospital stay and increase the risk of death almost two folds. several easily identifiable factors associated with large population of medication errors includes inadequate knowledge regarding drug therapy (age, allergy to particular drug, impaired renal function, appropriate dose calculation, drug nomenclature etc).(6)

Other most common factors which contribute to medication error include lack of drug information , incorrect diagnosis, drug-drug related interaction , dose miscalculation, incorrect drug administration and lack of patient education on medication, miscommunication of drug order resulting from poor handwriting , missing information when the drug is packed in to

smaller units, external factors such as interruption, work load, job related stress, improper training or education and sound alike look alike (SALA) packaging of medications. (7)

The National Coordinating Council for Medication Error (NCCMER) defines medication error as being "any preventable event that may cause or lead to inappropriate medication use or patient harm, while the medication is in the control of the health care professional, patient or consumer." Such events may be related to professional practice, healthcare products, procedures, and system including prescribing, order communication, product labeling, packaging, and nomenclature, compounding, dispensing, distribution, administration on documentation education monitoring and use. (8)

Phillips J et al did a retrospective analysis of medication errors between 1993-1996 and found that the most common types of errors were from wrong route of administration (9.5%), over dose (36.4%), wrong drug (19%), and administering improper dose (40.9%). The investigators also found that the most common causes of errors were performance and knowledge deficits (44%), and communication errors (15.8%). (9)

Medication errors directly impact the lives of the patients. It also leaves a lasting negative impression on the minds of the people about the hospital. These Medication errors can be broadly be classified in to five categories –

1. prescription errors
2. transcription errors
3. dispensing errors
4. administration errors
5. documentation errors

these medication errors are strictly dealt in patient safety point of view also and hence these can be further be subclassified as –

1. wrong form
2. wrong drug
3. wrong route
4. wrong rate of injection / ingestion
5. wrong time
6. wrong dose
7. wrong monitoring
8. wrong reporting
9. wrong preparation
10. wrong patient
11. wrong frequency
12. wrong scheduling
13. wrong administration
14. wrong documentation
15. wrong transition of medication
16. wrong reconciliation

Besides these medication errors other possible errors are –

1. extra dose of same medication
2. extra medicine of same group
3. administration of drug which is either stopped or withheld
4. allergic information not documented
5. inadequate or no supervision on self medication by patient
6. drug given but not documented or vice versa

7. mistake of omission or commission

Though they are preventable however sporadic incidences of medication errors do occur in every healthcare facility. Hence in order to reduce the incidences of medication errors it is essential to know more on the type of medication errors and the stages at which they take place. The medication ordering system has many components and breaches in these processes leads to medication errors, which can cause harm to patients.

The sequencing of medication of patient involves prescription of medicine by clinician, transcription the order, sending order to pharmacy, dispensing the medication from pharmacy to the ward or department, administration of medicine to patient, documentation of medication and assessing its effect. In this whole process each step is likely to have potential to cause medication error.

In November 1999 the Institute of Medicine in USA issued a report on patient safety with special reference to medical errors and titled "To Err is Human: Building a Safer Health System" and this report drew attention world over and resulted in increased awareness towards medical errors. This also enhanced the efforts towards patient safety. This report also became inspiration for the Institute for Healthcare Improvement's 100,000 Lives Campaign. (10)

From the patient safety and quality point of view all medication errors mandatorily need to be documented on prescribed form and analysed because by doing so will help the organization in avoiding errors, advance understanding of the short lapses and interference that lead to errors and also help to maintain public confidence in the healthcare system. (11)

The medication errors need to be prevented through effective control system. All staff who are involved in patient care are to be equally involved in medication safety as well and bring out ways and means to reduce medication errors. All the incidences which are related to medication error are due to less awareness about the hospital policies and training to staff on medication safety because all the staff involved in medication need to know the intricacies of patient medication hence mantle the responsibility.

Due to world over increasing emphasis up on quality patient care and patient safety issues it has become all the healthcare facilities to quantify the problem of medication errors and take essential steps to improve the quality of patient safety and patient care delivery. The details about the errors can be collected from various sources of patient care like medication charts, prescription letters etc. Investigating the incidence, type and nature of medication errors are very crucial to prevent them.

The purpose of the study was to identify and evaluate the incidence and types of errors and to assess the severity of medication errors level of patient safety.

II. MATERIALS AND METHODS

A thorough search of literature was done to find out various types of medication errors which occurred world over. During the literature review a in depth familiarisation with various aspects of medication errors was done and prospective study was done in the tertiary care hospital at Mumbai (Maharashtra).

Study Design : It was a prospective type of study in which admitted patients receiving medication during their stay in the hospital were studied.

Time Duration of Study : The total duration of study was four months from 01.02.2014 to 30.05. 2014.

Sample Size : Total six hundred eighty five patients medication process was studied as all admitted patients, irrespective of speciality, were followed irrespective of their duration of stay in the hospital.

Exclusion Criteria : Patients who refused to take medicines were excluded from study

Inclusion Criteria: All indoor patients who were admitted during the period of study .

Research Design : The methodology of discovering medication errors was done through various techniques namely direct observation, medical rounds to wards and pharmacy, quality circle rounds, motivation of staff, vigilance, counseling of staff, patient education, in patient case records, physician orders, medication audit etc.

Techniques to study Medication Errors :- The medication errors was detected with the help of following techniques –

1. Chart review
2. personal interview with staff
3. Incident reporting as a patient safety initiative and quality management process

4. motivated staff self reporting about medication error
5. dose checking by pharmacists on routine round
6. doses return to pharmacy
7. nurses / RMO'S shift change report
8. routine medical round and getting feedback from patient , families and staff members
9. routine Mediation audit by pharmacist and surprise audit by nursing superintendent or medical superintendent

III. RESULTS

During the study period total of 685 patients were observed for any medication errors of any kind and relevant data was collected. From collected data of total 64 incidences of Medication errors following types of medication errors were detected and taken in to consideration.

Out of 64 incidences of medication errors which were identified 05 (08.6%) were less than 20 years of age, 19 (35.8%) were in the age group of 20-40 years , 26 (41.1%) patients were in the age group of 40-60 years, and 14 (20.7%) were more than 60 years of age. [Table – 1]

Table -1 Demographic distribution for the cases of Medication Errors

Variable	Age less than 20 years		Age 20 -40 years		Age 40 – 60 years		Age more than 60 years		Cumulative %
	n	%	n	%	n	%	n	%	
N = 685	59	8.6	245	35.8	276	40.2	105	15.4	100
ME = 64	5	8.0	19	30.2	26	41.1	14	20.7	100

Based on demographic status of the patient who encountered medication error during their hospitalization duration female patients were 31.3% while male patients 68.7%. [Figure – 1]

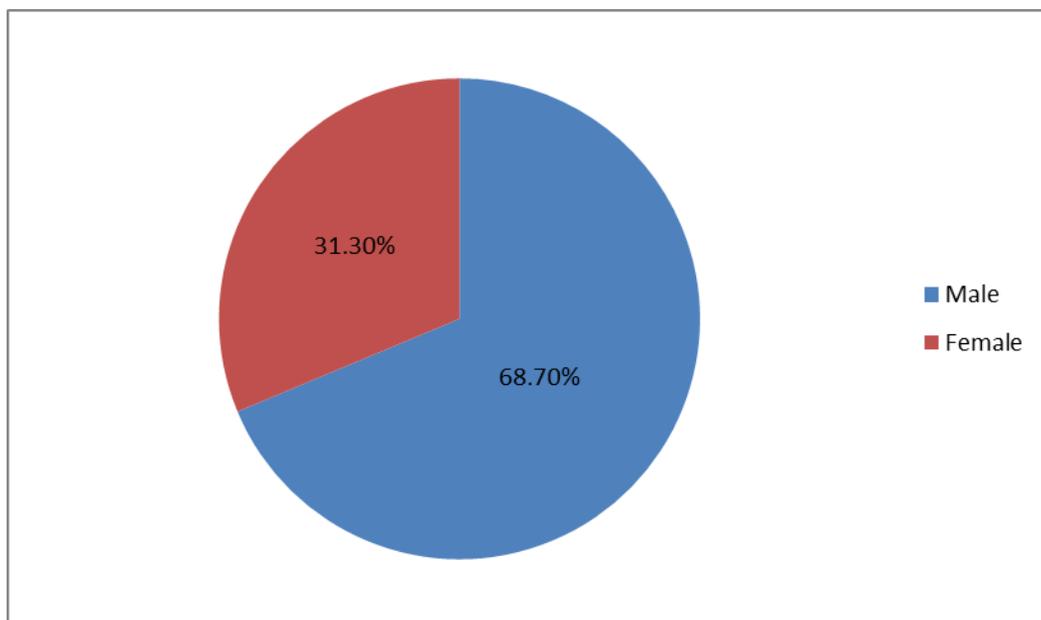


Figure -1 Demographic Status of the patients

While taking in to the account the type of medication errors the omission error was in 18 (28.1%) cases. This was followed by other types of medication errors which are described in the following table [Table-2]

Table 2 - Summary of Medication Errors

Type of Error	No of errors	Percentage (%)	Cummulative Percentage (%)
Omission of drug	18	28.1	28.1
Wrong time of drug administration	09	14.0	42.1
Wrong dose of drug	07	10.9	53.0
Wrong documentation	07	10.9	63.9
Wrong frequency of drug administration	05	07.8	71.7
Unordered drug given by nursing staff	05	07.8	79.5
Wrong dispensing of drug	05	07.8	87.3
Wrong route chosen for drug administration	03	04.6	91.9
Wrong drug administered	03	04.6	96.8
Wrong patient	02	03.1	100

The analytical study of medication errors on month wise distribution in June it was found to be 18 (28.1%), July 16(25.1%), August 17(26.5%) and in September it dropped down to 13 (20.3%). [Table - 3]

Table -3 Medication Errors as they were detected month wise

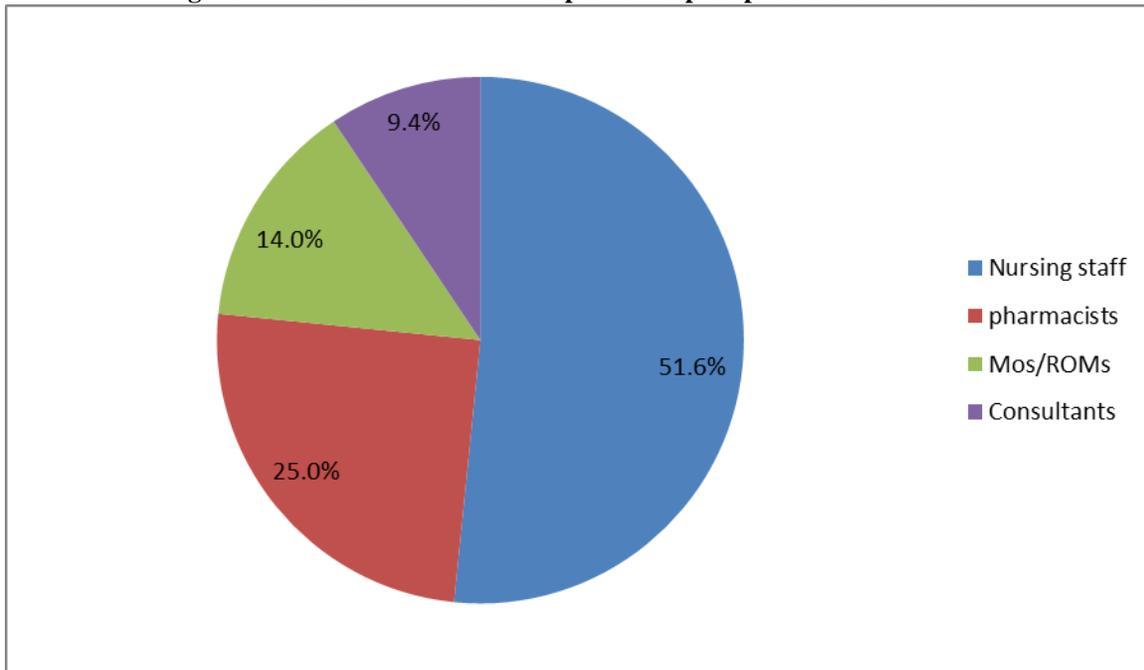
Months	Number of Medical Errors (n)	Percentage (%)	Cumulative Percentage (%)
Feb 2014	18	28.1	28.1
March 2014	16	25.1	53.2
April 2014	17	26.5	79.7
May 2014	13	20.3	100

Out of total medication errors during study period 06 (09.4%) caused by consultants, 09 (14.0%) caused by medical officers/ RMOs, 33 (51.6%) by nursing staffs and 16 (25.0%) by pharmacists. [Table - 4], [Figure-2]

Table -4 Medication Errors in respect of hospital professionals involved (N = 64)

Professionals	Number of medical errors (n)	Percentage (%)	Cumulative Percentage (%)
Consultants	06	09.4	09.4
Medical Officers / RMOs	09	14.0	23.4
Nursing Staff	33	51.6	75.0
Pharmacists	16	25.0	100

Figure -2: Medication Errors in respect of hospital professionals involved



The root cause analysis for available data for medication error so as to identify the cause which most directly responsible for the medication error. With increasing awareness towards the patient safety on medication and being mandatory as per accreditation processes like NABH and JCI all the events which

are of concern towards patient safety need to be analysed so as to pin point the cause in the complete cycle of medication of the hospitalized patient. The results which were obtained on the root cause analysis of the medication errors are summarized in tabulated form. [Table – 5,6]

Table -5 Medication Errors According to Major causes related to professionals (N = 64)

Professionals	Cause	Number of medical errors	Percentage (%)	Cumulative Percentage (%)
Nursing staff (n = 33)	Untrained nursing staff	07	22.4	22.4
	High activity duty hours	10	30.3	52.7
	Repeated distraction	16	47.3	100
Phramacist (n = 16)	Illegible handwriting	07	43.7	43.7
	High work load	03	18.7	62.4
	Generic drugs	02	12.5	74.9
	Repeated distraction	04	25.0	100
Medical Officer / RMOs (n = 9)	Unfamiliar Drugs	03	33.3	33.3
	High Duty working hours	04	44.4	77.7
	Repeated distraction	02	22.2	100
Consultants (n = 6)	Verbal orders	04	66.6	66.6
	Unclear medication orders	02	33.3	100

Table -6 Medication Errors According to Type of Medication Error (N = 64)

Type of Error	Subtype of Error	Number of cases (n)	Cumulative numbers of cases (n1)	Percentage (%)	Cumulative percentage (%)
Prescription Error 6 (9.3%)	Verbal orders	4	4	66.6	66.6
	Unclear medication orders	2	6	33.3	100
Transcription Error 16 (24.9%)	Illegible handwriting	7	13	43.7	43.7
	Medication order on wrong chart	4	17	25.0	68.7
		3	20	18.7	87.4
		2	22	12.5	100
Dispensing Error 17 (27.8%)	Wrong dispensing of drug	4	26	23.7	23.7
	Incorrect dose	5	31	29.4	53.1
	Required drug not dispensed in time	6	37	35.2	88.3
	Incompatible drug dispensed	2	39	11.7	100
Administration Error 25 (38.3%)	Medication not given to patient	8	47	32.0	32.0
	Wrong medication	5	52	20.0	52.0
	Wrong time	3	55	12.0	64.0
	Wrong dose	1	56	04.0	68.0
	Wrong frequency	1	57	04.0	72.0
	Wrong route	2	59	08.0	80.0
	Medication given even after it is ordered to stopped	1	60	04.0	84.0
	Medication to wrong patient	1	61	04.0	88.0
	Documentation of medication not done	3	64	12.0	100

Maximum number of medication errors were due to antibiotics 14(21.8%) followed by NSAIDS 12(18.8%),gastrointestinal 11(17.3%),cardiovascular 07(10.9%),diuretics and respiratory 05 (07.8%),steroids 04(06.4%), and lastly antidiabetics and anticoagulants 03(04.6%). [Table-7]

Table - 7 Medication Errors According to Class of Medication (N = 64)

Medication Class	Number of Medication Error (n)	Percentage (%)	Cumulative Percentage (%)
Antibiotics	14	21.8	21.8
NSAIDS	12	18.8	40.6
Gastrointestinal	11	17.3	57.9
Cardiovascular	07	10.9	68.8
Diuretics	05	07.8	76.6
Respiratory	05	07.8	84.4
Steroids	04	06.4	90.8
Antidiabetics	03	04.6	95.4
Angicoagulants	03	04.6	100

During the study it was also found that 4 patients had medication errors more than one time. one patient faced medication errors 3 times while 3 patients encountered medication errors twice.

IV. DISCUSSION

The complexity and dynamism healthcare organisations poses threat of making any error during patient care sometimes may become very serious thus threatening to life of patient. The medication is an integral part of patient care and error in medication can be source of significant morbidity and mortality in healthcare settings. (12)

In India irrational use of drugs is common and this has led to antibiotic resistance, adverse drug reaction medication errors and other drug related problems. (13)

Drug therapies are important part of medical care, contributing to medication errors and other drug related problems. keeping up with the growing number of prescription medications is a major challenge for the physicians, pharmacists, as well as medical and nursing staff working in healthcare facilities. At all levels the attention need to be shifted from medication itself to interaction between medication and patients. In India till recent years the concept of medication errors was taken very lightly however with the introduction of accreditation process under NABH, JCI the healthcare facilities have become more vigilant and serious about recognizing and analyzing medication errors.

A medication error is an episode associated with use of medication which is very much preventable by placing a system to control it. The medication process is a complex process consist of various attributes and the chances of errors increase because of lack of control on these attributes which are like prescription, transcription, dispensing, administration and lastly documentation.

The demographic report of study showed increased occurrence of errors in male patients 44 (68.7%) over female patients 20 (31.3%) which is similar to study conducted by Jerry Phillips et al in analysis of mortalities associated with medication errors which cited male predominance over females.(14)

The study brought out that omission error 18 (28.1%) was the most common error encountered was the most common of all errors occurred and is consistent with study conducted by Leelavathy D Acharya et al.(12) but inconsistent with studies conducted by Almut G Winterstein et al where prescription error was found to be the most common among all types of medication errors. (15)

Highest incidence of medication error was found among the patient age group of 30 -40 years in Massachusetts Board of Registration in Pharmacy (16) while in present study the highest incidence was found to be in age group of 40 – 60 years of patients which is similar to study conducted by Leelavathy D Acharya et al (12) which indicates that more patient of age group of 40 – 60 years visited the healthcare facility during the study period

On analyzing the medication errors on monthly basis it is revealed that in the initial month it was 18 (28.1%) which decreased in subsequent month to 16 (25.1%) and to rise again and fall thereafter so it has low and bounce phenomenon

however the lowest incidence was found to be in the month of September when it touched 13 (20.3%)

The analysis of medication errors occurred at the end of professional engaged in patient care brings out that out of 64 medication errors occurred during study period 33 (51.6%) errors were due to nursing staff of which 16 (47.3%) were due to repeated destruction of staff attention at workplace by either patients or family members, 10 (30.3%) were during high activity duty hours while 16 (47.3%) were caused by untrained nursing staff. Pharmacists were cause of medication errors in total 16 (25.0%) which on further analysis found to be because of illegible handwriting of clinicians in 07 (43.7%) cases, 04 (25.0%) because of repeated destructions at work place, 03(18.7%) errors caused during high work load period while 02 (12.5%) were because of lots of generic drugs. Medical officers / RMOs were involved in total 09 cases of which 33.3% (03) errors were due to unfamiliarity of RMOs to hospital formulary while 44.4% cases were occurred in high workload duty hours of morning shifts and 22.2% (02) cases were cause by repeated destruction at workplace by various factors related to patient, families and staff members. The involvement of the Consultants in causing medication errors was found to be in 06 cases of which 04 (66.6%) were caused by verbal orders by them to staff and 02 (33.3%) were caused by unclear medication orders to staff.

In the study where 64 medication errors were observed the most common error was found to be medication administration error 25 (38.3%) followed by in descending order of frequency are medication dispensing error 17 (27.8%), transcription error 16 (24.9%), 06 (9.3%) which is similar to study conducted by Clyde D ford et al on study of medication error in community hospital. (17)

The study revealed that antibiotics 14 (21.8%) was the most commonly error encountered followed by NSAID 12 (18.8%) and GI medication 11 (17.3%) these findings are inconsistent with study carried out by Jerry Phillips et al (14) which showed that largest number of medication errors occurred with the drugs of central nervous system followed by antineoplastic and cardiovascular system.

V. CONCLUSION

The prospective study on erroneous medication which was conducted concludes that incidence was found to be 9.3% seems not quite high and there was no fatal event as well. However the objective of study was to sensitise the concerned staff members involved in hospitalized patient about the errors in the vital activity of the patient management and if not vigilant and preventive steps not taken in time then the incidence may get higher and lead to life threatening event too. Each one has to play an important role in early detection and timely prevention of the medication error so as to improve the quality of Patient care and impart in patient safety. The study also enforce the need of development and establishment of drug protocols, hospital formulary and medication prescription policy in the hospital.

Conflict of Interest :- None declared

Limitation of the study :- The present study has limitations of duration and number of patient followed.

REFERENCES

- [1] American Society of Hospital Pharmacists, ASHP guidelines on preventing medication errors in hospital, Am. J. Hosp.Pharm. 1993.50 ; 305-313
- [2] Kohn LT, Corrigan GM, Donaldson MS, To err is human: building a safer health system, National Academy Press; Institute of Medicine, Washington DC 1999:78-81
- [3] Pote S, Tiwari P, D'cruz S. Medication Prescribing Errors in Public Teaching Hospital in India: A prospective study Pharmacy Pracice 2007. 5(1):17-20.
- [4] UD Food and Drug Administration : Retrieved from <http://www.fda.gov> Accessed on 16 May 2014.
- [5] Journal of Post graduate Medicine, 2005; 51(1): 22-25
- [6] Lusting A, Medication Error Prevention by Pharmacist, An Israeli Solution, Pharmacy World and Science 2000. 22 ;21-25
- [7] Medication Errors; Retrieved from http://www.fda.gov/cder/drug/med_errors/default.html.
- [8] The National Coordinating counsel for Medication Error (NCCMER) Retrived from <http://www.nccmerp.org/aboutMedErrors.html> Accessed on 20 May 2014.
- [9] Phillips P, Bean S, Brinker A, et al, Retrospective Analysis of Mortalities Associated with Medication Errors ; Retrieved from <http://www.ajhp.org/cgi/content/abstract/58/19/1835> Accessed on 02 May 2014
Study and Evaluation of Medication Errors in Multispecialty Tertiary Care Hospital
- [10] Mokdad, A, Marks J, Stroup D, Actual Causes of Death in the United States, 2000, Journal of the American Medical Association. 291 (10): 1238–45.
- [11] Zellmer W, Preventing Medication Error, Am J. Hosp. Pharma.1990. 47:1755-56
- [12] Leelavathi D A, Javed S, Padma GM, Study and Evaluation of Mediation Errors in Multidisciplinary Tertiarycare South Indian Teaching Hospital , Indian journal of Hospital pharmacy,2008. 48;54-58
- [13] Rajanandh G, Ruby V, Ramasamy C, Assessment of Drug Information Services in South Indian Tertiarycare Hospital in Kanachipuram District, International Journal of Pharmacy and Pharmaceutical Sciences,2013. 3(3): 273-276
- [14] Jerry P, Sammie B et al, Retrospective Analysis of Mortalities Associated with Medication Errors, Am J. Health Syst.Pharm 2001. 58 : 1835-41
- [15] Almut G, Thomas E, et al . Nature and Causes of Clinically Significant Medication Error in Tertiarycare Hospital, Am J Healthe-syst Pharm. 2004. 61:1908-16
- [16] Medication Errors Study, retrieved from www.mass.gov/dpl/boards/ph/phstudy/04.phrs.htm Accessed on 02 May 2014.
- [17] Clyde D, Study of Medication Errors on a Community Hospital Oncology ward , J Onco Pract , 2006. 2 (4) : 149-154

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