ANALYSIS OF DRUGS AND NON-DRUGS INDENTS FOR TURN AROUND TIME (TAT) AND SHORTAGE RECEIVED IN IN-PATIENTS PHARMACY (IP) FROM VARIOUS DEPARTMENTS IN A TERTIARY CARE HOSPITAL

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ABSTRACT
Introduction: Turnaround time (TAT) is the total time taken in between the submission of a process for completing and the return of the complete output to the users. Delays in drug supply to the patients can be serious; the effects can be horrifying in terms of mortality and morbidity. Pharmacists are uniquely qualified to manage and support health care organizations by leading utmost efforts to reduce the impact of drug shortages for patient care.

Methodology: A prospective observational study was done in in-patient pharmacy at a tertiary care hospital. A sample size of 540 medicine indents were audit. 330(61%) of indents were normal/general ward, 162(30%) were emergency/urgent indents and 48(9%) were dialysis indents. Data was obtained from the Ip-pharmacy department, recording the shortage of medicines and formulary adherence. The Collected data was analyzed and interpreted consecutively.

Results: In this study we identified 29% of the normal/general indents, 39% of the urgent/emergency indents and 10% of the dialysis indents were delayed. In addition, the average time taken to delivered normal/general indents was found to be 2 hours and 18 minutes and in critical wards it was found to be 1 hour 10 minutes. However, shortage of drugs was seen in 54 indents and substitution of drugs (mainly brand substitution) was found in total 27 drugs. The total number of non-formulary drugs prescribed was 44 drugs.

Conclusion: The results of our study intensely assisted in improving turnaround time (TAT) of the IP-pharmacy indents, maintaining the pharmacy stock, formulary adherence and more importantly patient care.

Keywords: Delay in IP-pharmacy, Formulary adherence, Medication turnaround time (TAT), Shortage of drugs.

INTRODUCTION
A multidisciplinary team of healthcare personnel provides better patient care, individual possessing a characteristic skills set appropriate to his/her allotted duties. For high-quality and safe patient care, the team should work cooperatively, remain focused, and professionally communicate. Health care team rely upon communication across departmental limits for effective functioning. The major expectation from the in-patient pharmacy department in the hospital is to make appropriate and correct drugs available at the right time. The delay in delivering of drugs and use of medicines interfere in the smooth functioning of pharmacy. Minimizing the medication turnaround time can promote efficiency, patient safety and quality of patients care. Turnaround time (TAT) is the total time taken in between the submission of a process/task for completing and the return of the complete output to the customer/user. Hospitalized patients may experience delays in proper care due to delay in administration of drugs. Delays can be serious, the effects can be horrifying in terms of mortality and morbidity, and so, continuous monitoring and efforts, methods and dedication of whole staff and co-
ordination among the staff members is needed for proper functioning of the process of pharmacy to motivate the lifelines of hospital. The process of implementation in electronic medication ordering system and pharmacy verification and dispensing are very effective than paper based systems as they; instantly delivered to the pharmacy, reducing the need for clarification phone calls to the provider. Improve medication turnaround time could assist providers to better adhere to evidence-based guidelines in case where medication usage is suggested for a given time in the patient care.³

The formulary is a continually reviewed compilation of pharmaceuticals and some important ancillary information that reflects the current clinical judgment of medical staff. WHO encouraged each hospital to produce a drug and therapeutics committee to manage selection of drugs.⁵ It is the cycle by which the medical, pharmacy and nursing staffs make use of this system.⁴ A standardized formulary enhances therapeutic opportunities for pharmacists, so it is an essential tool.⁶ The implementation of the formulary will have major outcome on clinical practice of health care professionals and also assists the physicians to know about the availability of drugs in the hospital pharmacy for better inventory control.⁴

Traditionally, Drug shortages have been rising since the early 2000s⁷ and are predictable as a global problem by the world Health Organization (WHO). Drug supply shortages can be defined as a shortcoming in the supply of medications which makes it impossible for suppliers to meet the demand for the product at the patient level.⁸ Medicines shortage pose intensive problems for patient health as a result of non-treatment, under-treatment and possibility of medication errors from attempts to substitute missing medicines⁹ and also a major serious challenge for health care institutions to develop consistent, effective, and safe patient care. They inculcate barriers to safe and effective medication regimen on a daily basis. A common practice during a drug shortage is to select an alternative drug to continue patient care without disruption.⁷ However, it has a direct outcome on patients and health care providers.⁸ The primary causes for shortage of drugs involve inadequate raw materials, reduced number of manufacturers, and other aspects. The impact of drug shortages is accomplished, with over 50% of health care practitioners believing that shortages have influenced practice and resulted in inferior patient care.¹⁰ Drug Inventory control is an essential element of Health care management, and its significant activity to achieve efficient patient care in a health care. The regular availability of the required medicines is the topmost priority for any hospital.¹¹

The main goal of this study is to maintain an effective medication dispensing process, monitoring of each step to reduce the turnaround time (TAT), and regulate the stocks of pharmacy to minimize the use of alternative drug therapy, and follows the hospital formulary to reduce the adverse effects and medication errors. Therefore implementing valuable measures in dispensing and adapting the hospital formulary in order to improve patient care and better life expectancy.
METHODOLOGY

A prospective observation study was conducted in a tertiary care hospital in IP pharmacy, for a period of one month effectively. A total of 540 medicine indents were audited, out of which 330(60%) from normal/general ward, 162(30%) from critical care unit/emergency and 48(10%) from dialysis ward were taken to count/observe the turnaround time (TAT) of in-patient pharmacy, to record the stock out/shortage of drugs and formulary adherence. The Data was recorded in a well prepared dispense tracking sheet for recording the turn-around time (TAT) starting from indent time to the time of receiving of items. Collection of data and set of medication orders, In addition, certain factors delaying the proper functioning of pharmacy or enhancing the TAT were observed and consequences behind them were examined. The quantitative data collected was analyzed and interpretation was done by using Microsoft Excel 2013.

RESULTS

In Pharmacy drugs and Non- drugs Indenting Process:

The process starting from the ward, nurse indenting or placing order for drugs and non-drugs like (gloves, syringes, catheters etc.) in electronic patient medical record software system till porter supplying the drugs in the respective wards. These will be carried out in a step-wise following manner:

1. Ordering of medicine from general wards, ICU or other areas.

2. Printing the order in the pharmacy department.

3. Time taken in collecting drugs, pharmacist should check the indents
   - Patient name or admission number,
   - Drug name, date of expiry of medicine, batch number to maintain stock (near expiry drug first dispense) and quantity of items.

4. Keeping the collected drugs on the respective racks as per the wards.

5. Verification of collected drugs and Dispatching.

6. Drugs reaching to the wards.

The standard time in delivering drugs against normal indents as per SOP’s of hospital was found to be 30 minutes, and for urgent/emergency indent 15 minutes. The average medication turnaround time (TAT) of general ward was 2 hours 18mins and critical wards was found to be 1 hour 10 minutes respectively. The total general indents followed was 330, 98(29%) of indents were delayed, indent took more than standard TAT and 240(71%) indents took 2 hours or less time. In total, 540 medicines indents were analyzed in in-patient pharmacy during the study period of one month. Departments wise indents, 330 from general wards, 162 from critical care unit and 48 from dialysis ward

A total of 2109 drug indents were prescribed by the physician to 540 patients. Out of 1365 (64.7%) drugs, the most preferred route of drug administration was oral (903 drugs) followed by parenteral/intravenous
(447 drugs) and ocular and nasal (15 drugs) route, as shown in chart-2

**Fig 1: Total Number of patients with gender distribution**

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>57%</td>
</tr>
<tr>
<td>Females</td>
<td>40%</td>
</tr>
<tr>
<td>Pediatrics</td>
<td>3%</td>
</tr>
</tbody>
</table>

**Fig 2: Distribution based on Route of administration of drugs.**

<table>
<thead>
<tr>
<th>Route</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral route</td>
<td>66%</td>
</tr>
<tr>
<td>Parenteral/I.V. route</td>
<td>33%</td>
</tr>
</tbody>
</table>
Average number drugs per indents were 3.9 (median 3). According to different categories of drugs prescribed by physicians in males and females were shown in table-1

<table>
<thead>
<tr>
<th>Drug Categories</th>
<th>Males</th>
<th>Females</th>
<th>Total percentage of drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular drugs</td>
<td>165 (12.08%)</td>
<td>90 (6.59%)</td>
<td>18.67%</td>
</tr>
<tr>
<td>Alimentary drugs</td>
<td>102 (7.47%)</td>
<td>84 (6.15%)</td>
<td>13.62%</td>
</tr>
<tr>
<td>Multivitamins &amp; supplements</td>
<td>96 (7.03%)</td>
<td>96 (7.03%)</td>
<td>14.06</td>
</tr>
<tr>
<td>NSAIDS</td>
<td>96 (7.03%)</td>
<td>81 (5.93%)</td>
<td>12.96%</td>
</tr>
<tr>
<td>Antibiotics</td>
<td>90 (6.59%)</td>
<td>126 (9.23%)</td>
<td>15.82%</td>
</tr>
<tr>
<td>Diuretics</td>
<td>60 (4.39%)</td>
<td>24 (1.75%)</td>
<td>6.14%</td>
</tr>
<tr>
<td>CNS drugs</td>
<td>54 (3.95%)</td>
<td>27 (1.97%)</td>
<td>5.92%</td>
</tr>
<tr>
<td>Anti-lipidemic drugs/ Lipid lowering agents</td>
<td>39 (2.85%)</td>
<td>12 (0.87%)</td>
<td>3.72</td>
</tr>
<tr>
<td>Anti-thyroid drugs</td>
<td>15 (1.09%)</td>
<td>21 (1.53%)</td>
<td>2.62</td>
</tr>
<tr>
<td>Anti-asthmatic drugs</td>
<td>15 (1.09%)</td>
<td>12 (0.87%)</td>
<td>1.96%</td>
</tr>
<tr>
<td>Genito-urinary tract drugs</td>
<td>6 (0.43%)</td>
<td>6 (0.43%)</td>
<td>0.86</td>
</tr>
<tr>
<td>Anti-diabetic drugs</td>
<td>10 (0.73%)</td>
<td>8 (0.58%)</td>
<td>1.31%</td>
</tr>
<tr>
<td>Anesthetic drugs</td>
<td>03 (0.21%)</td>
<td>12 (0.87%)</td>
<td>1.08%</td>
</tr>
<tr>
<td>Hepato-protective agents/ drugs</td>
<td>03 (0.21%)</td>
<td>6 (0.43%)</td>
<td>0.64%</td>
</tr>
<tr>
<td>Muscle relaxant</td>
<td>0 (0%)</td>
<td>6 (0.43%)</td>
<td>0.43%</td>
</tr>
</tbody>
</table>

The non-drugs like gloves, syringes, catheters, i.v sets, scalpels blades, and other surgical needs. A total number of Non-drugs was 564(41.3%) and the total number of other-drugs 180 (8.53%), the other-drugs include inhalers, I.V drips, high risk drugs (sod. Bicarbonate, dopamine, potassium chloride, suppositories and enemas, etc.

The various organizations including General patients of 225 indents (41.66%) Health care insurance scheme like Arogyasri 186 indents (43.44%), Udyogasri 51 indents (9.44%) and other insurance schemes 78 indents (14.44%) include Employment State Insurance (ESI), Medi. astt India Pvt.ltd, Telangana Southern Power Distribution Company Limited (TSSPDCL), ICICI Prudential Life insurance and others.

Implementation of government schemes in India has improve health services for its population, utilizing these service in a various health related treatments and it also provide significant health and economic benefits to people below the poverty line.

In our study stock out/drug shortage were identified in 54 indents of patients, due to the non-availability of prescribe drugs in pharmacy alternative drugs/agents has made
a choice, and brand substitution were noted in 27 patient’s indents.

Fig 3: Distribution of various organization schemes

Fig 4: Treatments based on Cash and Government Insurance Scheme
DISCUSSION

The increase in turnaround time (TAT) for dispensing or supplying of medication in various wards, few of the consequences that result in delay of medication dispensing were:

1. Delay occurs in delivering of medicines due to stock variability
2. Software issues of the department which cause delay since the indents were not being received in various departments.
3. Random indents from wards.
4. Lot of workload on the department due to lack of staff in nighttime as compared to daytime.
5. Expensive drugs which have been dispatched from the pharmacy does not reach the individual wards, through general duty assistants.

The total emergency or urgent indents tracked was 162, 63(39%) of the indents were delayed, and 99(61%) emergency indents were delivered within time. And total dialysis indents were 48, 5(10%) indents were delayed and rest of their delivered in time. According to Standard Operating System (SOPs), the general indents drugs must be delivered in 30 minutes and the emergency indents drugs delivered within 15 minutes. We observe that maximum time taken in delivering of emergency drugs was 56 minutes or approximate to an hour. This is the more huge time taken as compared standard TAT, it happens mostly because of the pharmacy staff waits for the assistant to come and collect the drug items and the assistant staff negligence, inattention of staff to delivery on time and lack of assistants.

Vijay Pratap Raghuvanshi et al. study shows that out of 170 normal indents, 43(23%) of the indents were delayed, that took more than 2 hours and 127(77%) indents took 2 hours or less time and total of 50 emergency indents, 30(60%) of the indents are delayed, and 20(40%) urgent indents are delivered on time.

Our study improved the delay of emergency indents as compared to Vijay Pratap Raghuvanshi study i.e 63/162 (39%) of indents were delayed and 99/162 indents were delivered within time.

One precaution to control drug shortage when drugs becomes low on stock is to provide an alternative of drugs having the same effects, drugs substitution which can helps to pharmacies to minimize this shortage until the stock maintained to a regular levels. But during drug shortage, alternative or different concentration provided, that may leads to dosing errors in patients may be those concentration they are not used to. In our study 54 indents were faced to stock out/shortage of drugs and 27 drugs substitution were did due to the unavailability of stock in central pharmacy but manage immediately by getting those medicines from outside pharmacy, some of the drug substitutions like. Trilodol prescribed brand substituted and given ultracet, tab. panzole-40 mg to tab. Pan-D, tab.Dolo-650mg to tab. Amol-650mg, and tab.Amlonkind-10mg to tab. Amlong. During our study period we also observed and recorded the prescribing of non-formulary
(or) out of hospital formulary drugs, and the total number of non-formulary drugs was 44.

RECOMMENDATIONS
The drugs can be dispatched in the paper bags with the details (Name, Admission no. and wards) of respective patients so that at the nursing unit, less time will be consumed in segregation of medicine and non-drugs.

Emergency or urgent indent items should be dispatched immediately after collections of medications and not be kept in rack for a longer period of time. One or two assistant should be there for dispatching the urgent or emergency medication in a less time as soon as possible and priority should be given for urgent cases. Regular training should be given for each staff (involve in indenting) and part of induction program for new employees.

Regular store audit should be done in order to take out the near expiry and expiry medications which are not being removed and regular checking of the storage of medicines should be done.

Prescribing the medication out of formulary leads to substitution of drugs, which may or may not tolerated by patients results in medication error and negative impact on patient care. Poor formulary adherence (compliance) result in treatment failure and adverse effects.

CONCLUSION
Everyone within the circle of care, first has to ensured patient safety in every step of process from the initial step of selecting the appropriate medication to prescribe, to dispensing the medication is improved to prevent delays in therapy and medication errors. Eventually, it is most important that effective communication takes place to ensure accurate prescriptions and optimal patient care.

Our study results will assist in improving turnaround time (TAT), Adherence to formulary and patient care of hospital. After the study there were some considerable improvements, such as training sessions were undertaken for the nurses and staff and proper dispensing of medication, strictly following the turnaround time and use of formulary and non-formulary drugs were tried to put in to practice and also we were able to gather information about ordering practices, following the hospital formulary will improve better patients care and life expectancy and these information could be beneficial for training requirements within the departments of the hospital.

REFERENCES
3. Vijay Pratap Raghuvanshi, Himanshi Choudhary, Medication Turnaround Time
In Hospital Pharmacy Department, August - September, 2013, Vol. 2, No. 5, pp 626-630.


6. Amy K. Erickson, Together is better: Standardizing a health system formulary, September 2013.

7. Milena McLaughlin, PharmD, MSc, BCPS, AAHIVP; Despina Kotis, PharmD, FASHP; Kenneth Thomson, BS, MBA; Michael Harrison, BS; Gary Fennessy, BS, MBA; Michael Postelnick, BS, BCPS AQ-ID; and Marc H. Scheetz, PharmD, MSc, BCPS AQ-ID Effects on Patient Care Caused by Drug Shortages: A Survey, Nov-Dec 2013 Vol. 19, No. 9

8. Shaker Alshehri and Abdulrahman Alshammari, Drug supply shortage in pharmacies: Causes and Solutions; A Case study in King Khaled Eye Special Hospital -2453-2459, 2016.


10. Celeste R. Caulder, PharmD; Brenna Mehta, PharmD; P. Brandon Bookstaver, PharmD, FCCP, BCPS (AQ-ID),