

Summer Training
at
Zydus Hospital, Ahmedabad



From 1st April to 30th May

A Report on
**Turnaround Time of Pharmacy supply chain and Inventory/Material Management
by analysis of ABC and VED reports**

by
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MBA Pharmaceutical Management
2018-2020



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CERTIFICATE

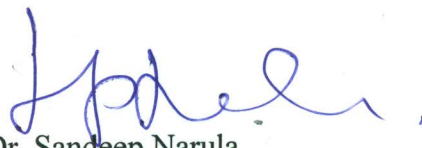
This is to certify that **Dhara Parikh** has undergone Summer Training at **Zydus Hospital, Ahmedabad** from 1st April 2019 to 31st May 2019.

The candidate herself has completed the project assigned to her in summer training. Her approach to project was sincere and proactive. This Summer Training is in partial fulfillment of the course requirement recommended for the award of MBA in Pharmaceutical Management.

I wish her success in all her future endeavors.

A handwritten signature in blue ink, appearing to read 'Ashok Peepliwal', with a stylized flourish at the end.

Dr. Ashok Peepliwal
Associate Professor
School of Pharmaceutical Management
IIHMR University, Jaipur

A handwritten signature in blue ink, appearing to read 'Sandeep Narula', with a stylized flourish at the end.

Dr. Sandeep Narula
Dean-in-charge (Associate Professor)
School of Pharmaceutical Management
IIHMR University, Jaipur



ZHHRPL/HR/INTERN/SUPPLY CHAIN/1/2019

Date: 30th May 2019

TO WHOM IT MAY CONCERN

This is to certify that **Ms. Dhara Parikh**, of IIHMR University has completed Internship in the **Department of Supply Chain** from our Hospital under the guidance of **Mr. Mukesh Patel – Lead, Supply Chain**.

The topic of Training was **“Inventory & Material Management by Analysis of ABC and VED Reports”** and **“Turnaround Time of IP and OP Pharmacy”**. The duration of Training was from **1st April 2019 to 30th May 2019**.

During above period we found her very sincere and hardworking.

We wish her all the best for her future endeavor.

For, Zydus Hospitals and Healthcare Research Pvt. Ltd.

Sachin Nair
Lead – Human Resources

HUMAN RESOURCES

Zydus Hospitals & Healthcare Research Pvt. Ltd.

Zydus Hospitals Road, S. G. Highway, Thaltej, Ahmedabad - 380 054, Gujarat. T: 079 66 190 201 (Board) CIN: U24233GJ2008PTC054191

Registered Office: 16, Azad Society, Ambawadi, Ahmedabad - 380 015, Gujarat. | www.zydushospitals.com

Acknowledgements

Very firstly I would like to thank our academic dean **Dr. Sandeep Narula Sir** for giving me such a great opportunity to work towards my dream and my grand-father and dearest mom for always being my backbone to complete these projects and I would also like to thank my academic mentor **Dr. Ashok Peepliwal Sir** for always encouraging me.

I highly appreciate the support from my industrial supervisor, **Mr. Mukesh Panchal Sir** and would like to give him lot of thanks for always having faith in me.

I would also like to thank my industry mentor, **Mr. Nirav Rajput**, associate purchase at Zydus hospital for always encouraging and guiding me for giving my best every day.

Last but not the least I would like to thank associate HR team of Zydus Hospital, **Ms. Rupal Modi and Mr. Rahul Verma** for always showing their invisible support.

Dhara Parikh.

❖ **Table of Contents**

Acronyms/Abbreviations	4
Zydus hospital profile	5
Abstract	20
Introduction	21
Rationale	24
Research question and objective	24
Data collection and methodology	25
Data analysis	26
Interpretation and conclusion	35
References	37

❖ **Acronyms/Abbreviations**

1. Medication Turnaround Time
2. Delay in In-patient pharmacy
3. Medication errors
4. Central store management
5. OT store management
6. Turnaround time
7. Material Management,
8. RTS-Return to stock
9. EOQ- Economic Order Quantity
10. ABC-Always Better Control
11. HML- High Medium, Low
12. VED-Vital, Essential, Desirable
13. TAT-Turn Around Time

ZYDUS HOSPITAL

INTRODUCTION

Zydus Hospitals is a 550 bed Super specialty medical institution spanning 16 floors and 2 basement floors. This world class & highly sophisticated medical establishment offers all major medical specialties, subspecialties, investigation & diagnostics facility, rehabilitation & physical therapy care under one roof. Hospital's design ensures higher energy efficiency by allowing greater permeation of sun light throughout the day and harnessing solar energy for hot water provisioning throughout the hospital complex.

Quality

Zydus Hospitals brings in a tradition of Trust & Faith, being among the leader in pharmaceuticals vertical, they now extend their services to the society through a chain of multispeciality hospitals, offering world class infrastructure, highly skilled and experienced medical specialists, caring & compassionate nursing staff and technology which matches the best in the world.

They are committed to All Round Quality, from their patient care services to medical facilities they are taking stride aiming at achieving highest level of Quality Certifications.

Their Anand unit is the first private hospital to receive NABH Certification in the district.

The flagship multispeciality unit in Ahmedabad has been accredited by NABH in Sept 2016.

They are committed to medical excellence & transparency across all the walks of hospital with "Patient First" approach.

SALINT FEATURES OF HOSPITAL

Zydus Hospitals has very selectively appointed the best of American / Europe Trained Medical Specialists, Paramedics, Nursing & Administrative Staff. This would be amongst the handful hospitals in its league which have dedicated full time medical specialists. This shall ensure complete round the clock care and availability.

SPECIALITIES CURRENT OFFER AT HOSPITAL

At Zydus, they are committed to Spreading Smiles, along with their quality of personalized care and their pricing too shall bring smiles.

At Zydus Hospitals, “we are committed to LIFE.” is their slogan.

- ✓ Zydus Hospitals is committed to excellence and quality with an established focus on the well-being of patients. They provide the right mix of cutting-edge technology, warmth and compassionate care. Backed by the best team of medical professionals and procedures, they offer the best in private healthcare in a cost-effective way.
- ✓ They provide the highest standard of clinical skills and nursing care across an extensive range of specialties and attract world-class doctors and surgeons from leading hospitals.
- ✓ Located in Anand, Gujarat, the hospital offers locational advantage and world class infrastructure for the patients and their visitors and is one of the most modern private hospitals in India, equipped with state of art technology.
- ✓ Delivering an array of medical services, they offer in-patient, out-patient, day care treatment, surgery, emergency and trauma care in the finest surroundings. What's more, these services can be provided as a part of patient's own private health insurance scheme or self-finance.
- ✓ They believe that focusing on the comfort of their patients helps in their recovery. They cater to individual tastes and requirements to ensure that patients feel as relaxed and comfortable as possible during their stay.

Vision Statement:

“To be a leading provider in healthcare service delivery to the community. We shall achieve 1500 beds under our management by the year 2020 and become a most preferred destination for comprehensive medical care and treatment.”

Mission Statement:

“To provide world standard healthcare solutions to the community by leveraging advances in medical research science and technology and adoption of best management practices.”



Core Values:

The members of the Zydus Hospitals hold the following values to be the foundation of their identity.

1. Patient Centric

They are Patient Centric. They put the needs of the patient first in all their actions.

2. Adaptable to Change

They welcome change for the better; their approach is always positive with a ‘can-do’ spirit.

3. People-Driven

They build the capabilities of their people. This is fundamental to their growth in business.

1. Committed to Deliver

They give their best in all that they undertake and are committed to deliver on time.

2. Innovative in What they Do

They innovate through their ideas, approaches and efforts - at every opportunity.

6. Humble

They remain modest and humble in their achievements. Their work speaks for itself.

7. Value-Driven

They seek value and maximize their gains by using their resources judiciously.”

❖ Floor details of Zydus hospital, Ahmedabad.

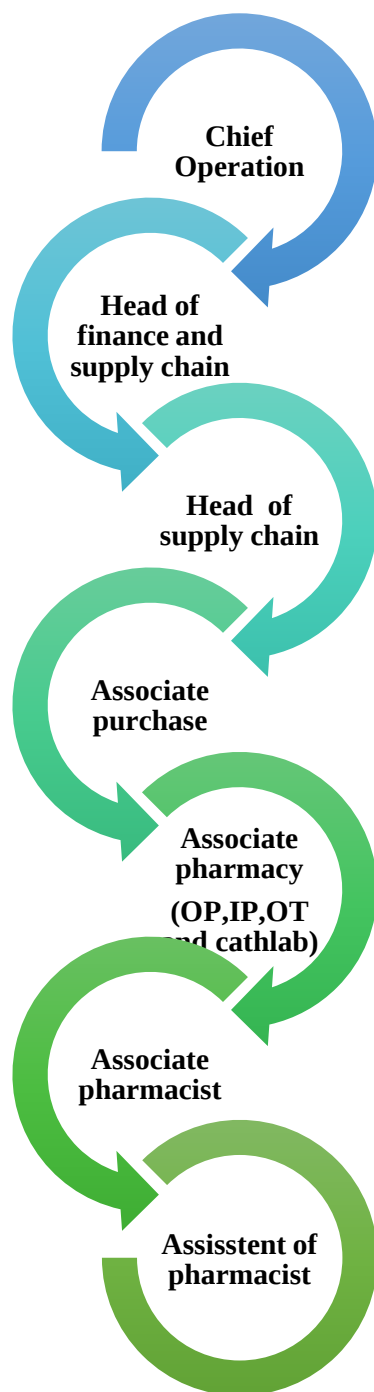
FLOORS	DEPAERTMENT
00	A. ZYDUS HEALTH CHECK UP B. RADIOLOGISTICS IMAGING C. EMERGENCY & ER OT D. ADMISSION & BILLING, CAFETERIA, PHARMACY
01	A. OPD, EEG &EMG B. OPD, ECHO, TMT, ECG C. PHYSIOTHERAPY & REHAMBILITATION, DENTAL D. OPD

02	A. ENDOSCOPY, LITHOTRIPSY & URODYNAMICS B. MOTHER AND CHILD CARE C. DIALYSIS D. FOOD COURT
03	A. SURGICAL ICU -3A B. OPERATION THEATER COMPLEX C. OPERATION THEATER COMPLEX D. TRANCEPLANTICU &SURGICAL ICU-3
04	A. RELATIVE STAY AREA, STORES B. CENTRAL STERILE SUPPLY DEPARTMENT C. MEDICAL RECORD DEPARTMENT D. BLOOD BANK
05	A. OPERATION THEATER COMPLEX B. OPERATION THEATER COMPLEX C. OPERATION THEATER COMPLEX D. CVTSICU-5D

06	A. CATH LAB & CARDIAC ICU-6A B. CARDIAC ICU C. CVTS ICU-6C D. CVTS ICU-6D
07	A. CRITICAL CARE UNIT -7A B. PEDIATRIC ICU & NEONATAL ICU C. LABOUR DELIVERY COMPLEX D. NEURO ICU
08	A. EXECUTIVE TWIN SHARING B. EXECUTIVE TRIPLE SHARING C. EXECUTIVE TRIPLE SHARING D. EXECUTIVE TWIN SHARING
09	A. STANDARD BED 901 TO 919 B. STANDARD BEDS 920 TO 935 C. AUDITORIUM D. ADMINISTRATION
10	PREMIUM ROOMS
11	PREMIUM ROOMS
12	PREMIUM ROOMS
13	PREMIUM ROOMS

14	SUITS
15	PRESIDENTIAL SUITS

ORGANOGRAM OF SUPPLY CHAIN DEPARTMENT



PROJECT REPORT-1

ABSTRACT

Medication turnaround time is the interval from the time a medication order is written electronically to the time the medication was administered. Monitoring medication turnaround time in inpatient and outpatient settings allows organization to measure the impact of their efficiency of patient care. The aim of the study is to assess the turnaround time in inpatient pharmacy and outpatient pharmacy to identify the average time to do various process at inpatient pharmacy and OP pharmacy To find out the delays in the order and delivery system of IP D (In-patient pharmacy) and OP (outpatient pharmacy) and figure out the average total time consumed in delivering drugs and medical consumables to the patients and also To find out the peak hours of indent. A time motion study was done in the inpatient pharmacy and outpatient pharmacy at ZYDUS hospital. A sample size of 300 indents was taken in inpatient pharmacy and sample of 100 prescription was taken in outpatient pharmacy by using nonprobability convenient sampling method. Both primary and secondary data has been used in the study. The secondary data was obtained from the HINAI WEB CONNECTED CARE SOFTWARE, which was used in the pharmacy. Microsoft excel was used for data analysis.

Conclusion

Through this study, we were able to identify various points of delays, which were occurring in delivering indents to the patients. The results of the study revealed that all types of indents were delayed; especially urgent indents also got delayed, which became the major area of concern. In addition, if hospital follows indenting practices by the nursing staff, then the training for nursing staff is essential requirement regularly, to overcome this problem. The results of the study will benefit in improving TAT of the pharmacy indents and most importantly the patient care.

INTRODUCTION

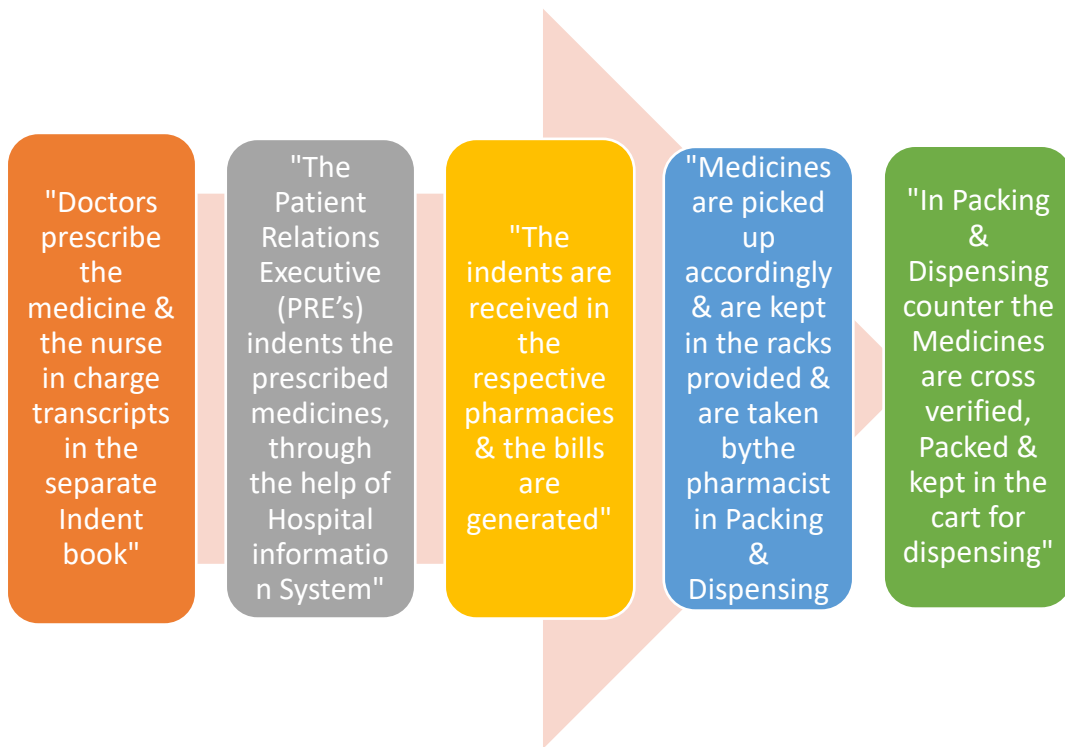
Medication turnaround time can be defined as the time in between when a medication indent is composed, either hand written or electronically recorded, and the time medications are delivered to the nursing unit. Medication error is defined as any preventable event that may lead to inappropriate medication usage or harm to patient while the medications are in the control of the health care professional.

Turnaround time (TAT) is the total time taken in between the submission of a process/task for execution and the return of the complete output to the customer/user. Turnaround time is one of the metrics used to evaluate operating system scheduling algorithms.

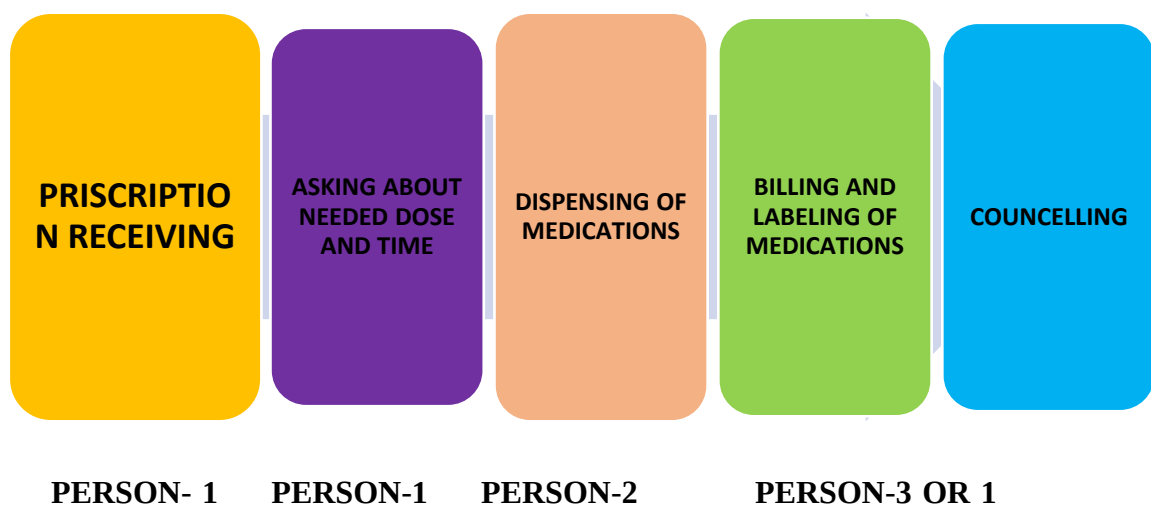
Many studies have shown that electronic processes for medication ordering and drug dispensing are more efficient than paper-based systems because they are: (1) Instantly delivered to the pharmacy as compared to hand written prescriptions by the physician. (2) They are easier to read when compared to copies of physician's handwriting. (3) The required fields are all completed. (4) It is clearer to the pharmacist, reducing the need for verification by phone calls to the physician who prescribed the drug. Studies have shown that there was 64% of reduction in turnaround time when electronic processes are used.

- **A Study on Turnaround Time of Online Indentation of Medicines in a Zydus Hospital**

FLOW PROCESS OF IN-PATIENT PHARMACY DEPARTMENT



FLOW PROCESS OF OUT PATIENT PHARMACY



❖ FREQUENT DELIVERY FLOORS FROM IPD

FLOOR	DEPARTMENT/ROOM NO.
2ND	DIALYSIS
2ND	ENDOSCOPY
3RD	TICU
3RD	OT PHARMACY
5TH	CVTS
6TH-A WING	DAY CARE
6TH-A WING	CATH LAB
CATH STORE PHARMACY	PHARMACY
6TH-BWING	MICU
6TH-C WING	ICU
7TH-AWING	CCU
7TH-A WING	MATERNITY
7TH-B WING	NICU
7TH-B WING	PICU
7TH-D WING	NEURO ICU
8TH -A WING	801 TO 820
8TH-B WING	821 TO 844
8TH - C WING	845 TO 868
8TH-D WING	869 TO 888
9TH	DILYSIS
10TH-AB WING	1001 TO 1020
10TH-CD WING	1021 TO 1040
11 TH -AB WING	1101 TO 1120

11 TH -CD WING	1121 TO 1140
12 TH -AB WING	1201 TO 1220
12TH -CD WING	1221 TO 1240
13TH-AB	1301 TO 1320
13TH- CD	1321 TO 1340

❖ **Factors affecting Turnaround Time:**

“The major factors that influences the process of online indenting process which influences turnaround time of dispensing of medicines to the wards are:

1) Sequencing in Order: The First in first out principle was not followed while picking up the bill as well as while packaging the indents. The pharmacist’s while packing of the drugs would pick up the trays of indents that were closer to his hands and the other indent trays would be just lying on the rack which causes a delay. The indent which is kept on the table 1st must be picked up 1st and packed. The sequential order must be followed which adds to the delay of dispensing of the drugs. There is a lack of co-ordination among the pharmacy associates and pharmacists.

2) The efficiency of the associates and packaging staffs: distractions and disruptions in conversations while the picking and packaging of the indent resulted in slowing the process and resulting in delays.

3)Waiting For the dispensing trolley to get filled: Only when the dispensing in trolleys are filled the medicines are dispensed to the wards. Half fill trolleys are were never taken for distribution as a result the indents which are already packed and kept faced delay in delivery

The other Factors which plausibly causes delay in dispensing include:

- 1) Frequent enquiry calls to the pharmacy from wards on not receiving the drugs on time and hence disrupting the work process in in-patient pharmacy.
- 2) The space in the in-Patient Pharmacy as well as the structure of the of hospital also could be taken into consideration.

❖ RATIONALE

“Every Healthcare facility, big or small, would like to have its very own pharmacy to meet the medicine requirements of patients. It is one of the critical areas of healthcare facility as well. Approximately 20 percent of hospital cost, i.e. more than half of the materials budget, is accounted for medicines & pharmaceutical supplies. Availability of the right drug at the required place at the time of need is the key to the healthcare facility’s existence.” “Consequence of delays can be disastrous due to nonavailability of the right drug at the right time. Drug-Dispensing Systems in hospitals can be collective or individualized”

❖ RESEARCH QUESTION

Does the hospital pharmacy system comply with the standard turnaround time in medication supply in the in-patient pharmacy and out-patient pharmacy department?

❖ OBJECTIVES

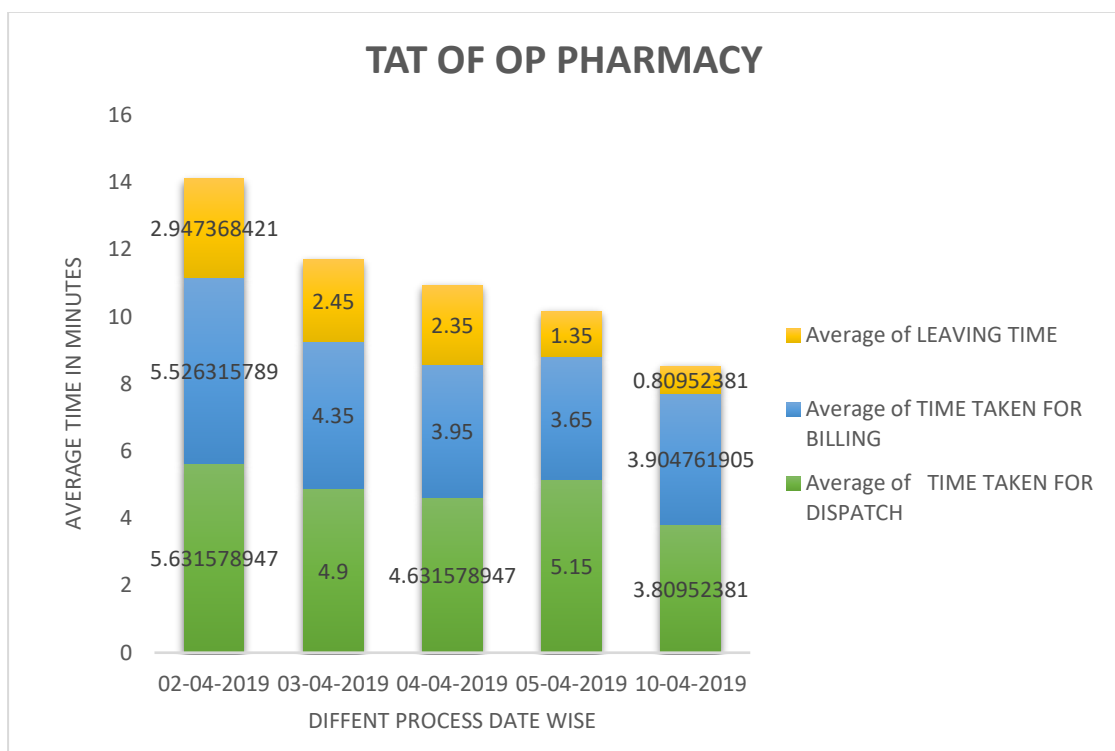
1. To identify the TAT of OPD pharmacy
2. To identify the TAT of IPD pharmacy.
3. To identify the factors which are responsible for delay of TAT.
4. To identify the peak hours of IP PHARMACY.
5. For comparison of actual TAT with standard TAT IN OP and IP pharmacy.
6. To identify the gap time between all the processes in TAT.

❖ DATA COLLECTION AND METHODOLOGY

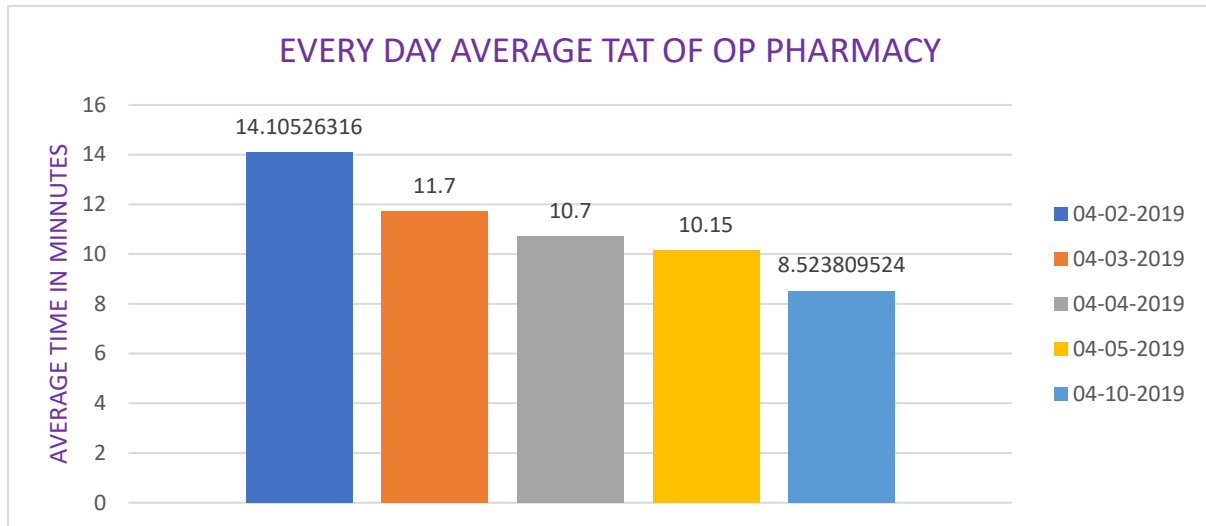
A Prospective Observational study in the In-Patient Pharmacy Department and out-patient pharmacy department of Zydus hospital, Ahmedabad. Sampling was done by using nonprobability convenient sampling method. Both primary and secondary data has been used in the study. The secondary data was obtained from the HINAI WEB CONNECTED CARE SOFTWARE, which was used in the pharmacy. The study was undertaken for a period of 14 days with a sample of 300 indents from in-patient department and 100 patients from out-patient department. The data collection was done manually in the in-patient department and from google forms in out-patient department. Pharmacy. The collected data was analysed using MS Excel and Power-

BI. Prior to the data collection, approval to conduct the study was obtained from HOD of supply chain department and HR department.

❖ DATA ANALYSIS AND INTERPRETATION

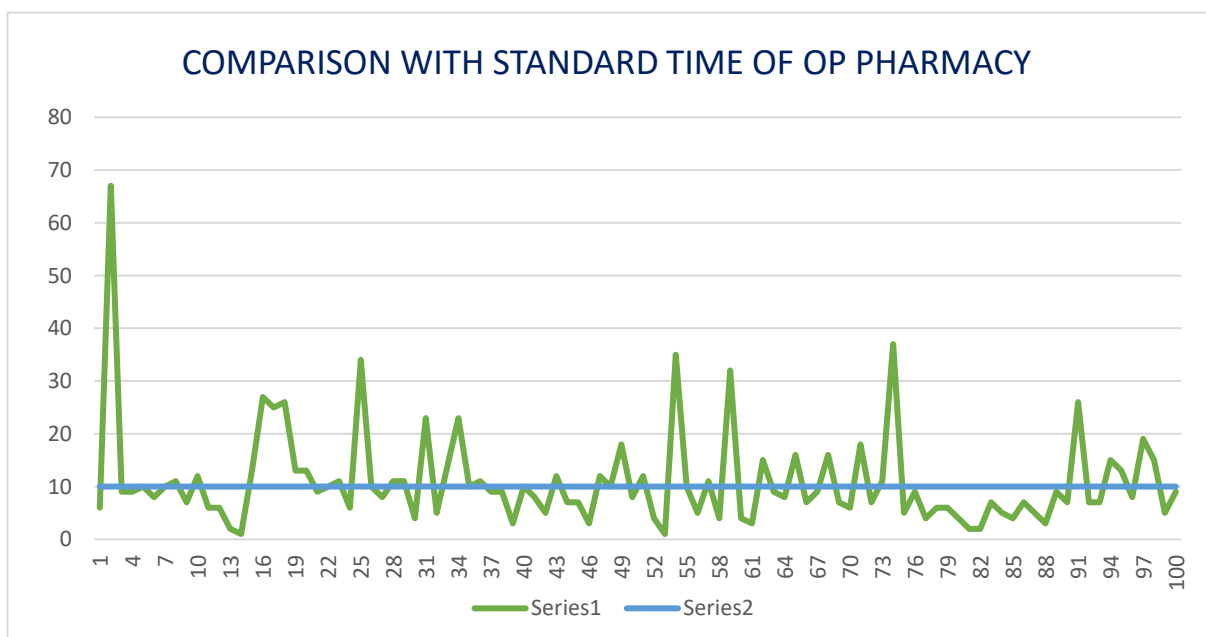


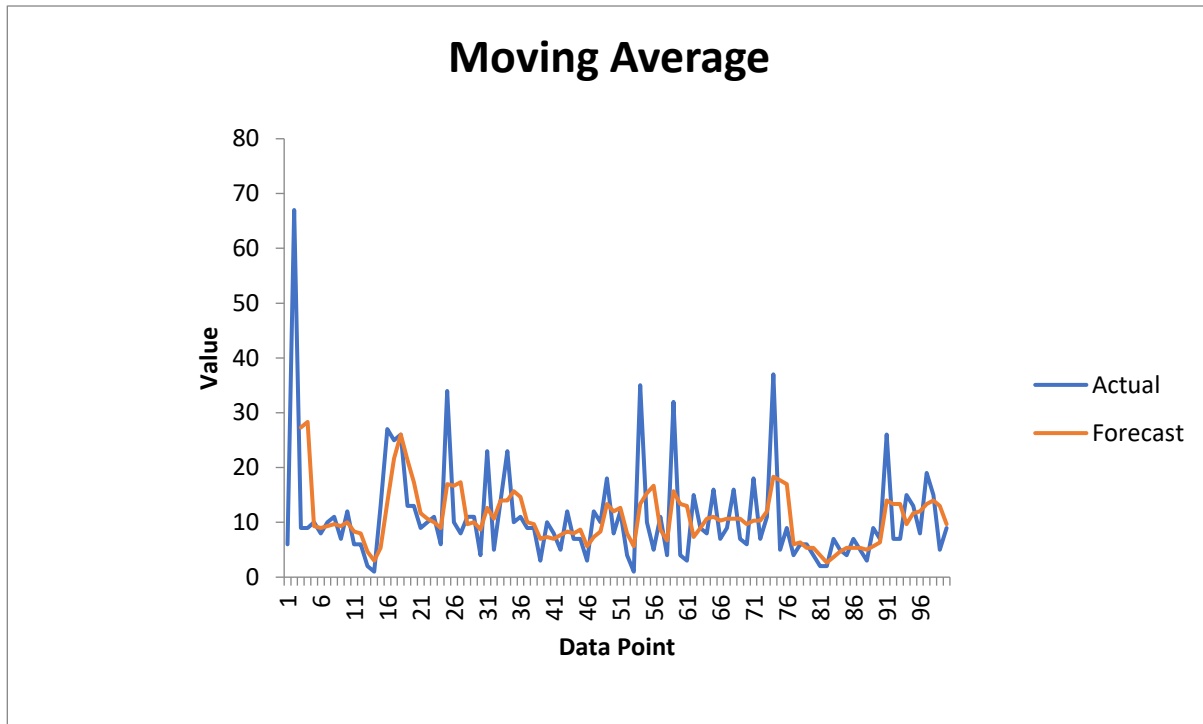
- Hear in the chart it is depicted average time for every process done in the out patient pharmacy on the daily bases
- As we can see the average dispatch time and billing time is highest on 2nd of April.
- To reduce the average dispatch and billing time the management should recommend automated online prescription by doctor and conformation of patient should be sent to the pharmacy about the number of days for which they want the medicine.



As we can see the overall TAT of OP is around 11min. It varies around +3 to -3min day-wise.

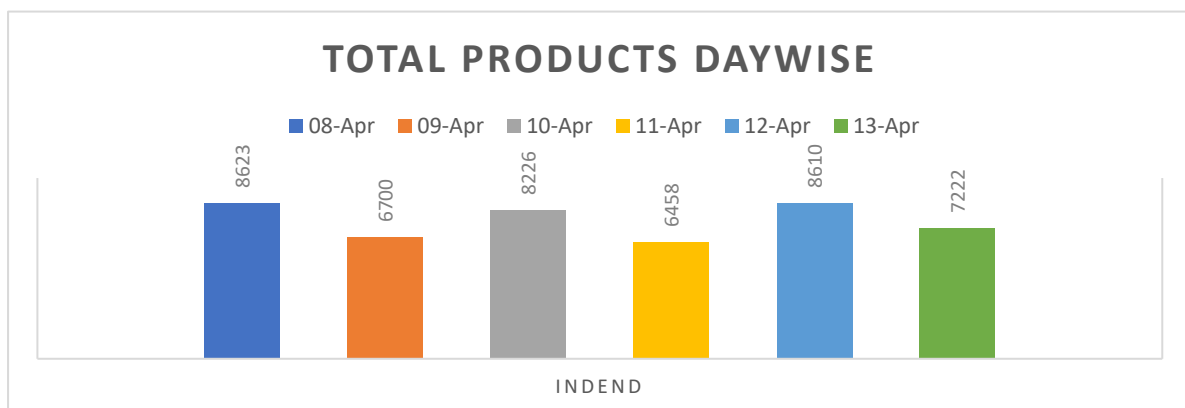
- The standard TAT of OP pharmacy is 10 min.
- But the actual time varies on the daily bases and there are some outliers too.





On the bases of the regular pattern of TAT in OP we had forecasted the TAT for future, but the actual TAT somewhere differs from the forecasting.

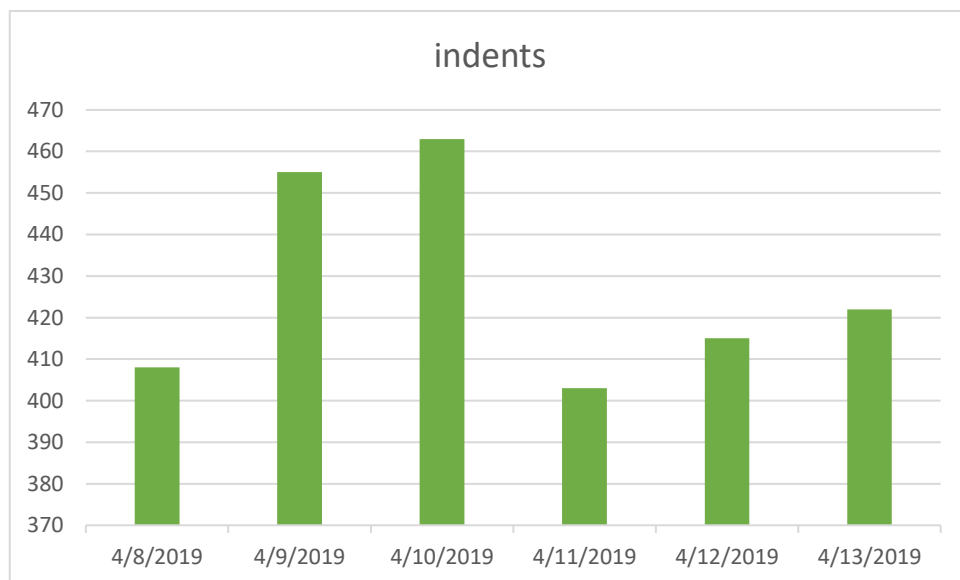
PER DAY PRODUCT LINE FREQUENCY



PRODUCTS	DAY
8623	MONDAY
6700	TUESDAY
8226	WEDNESDAY
6458	THURSDAY
8610	FRIDAY
7222	SATURDAY

As we can see that highest number of product request were received by IP pharmacy was on Monday and Friday.

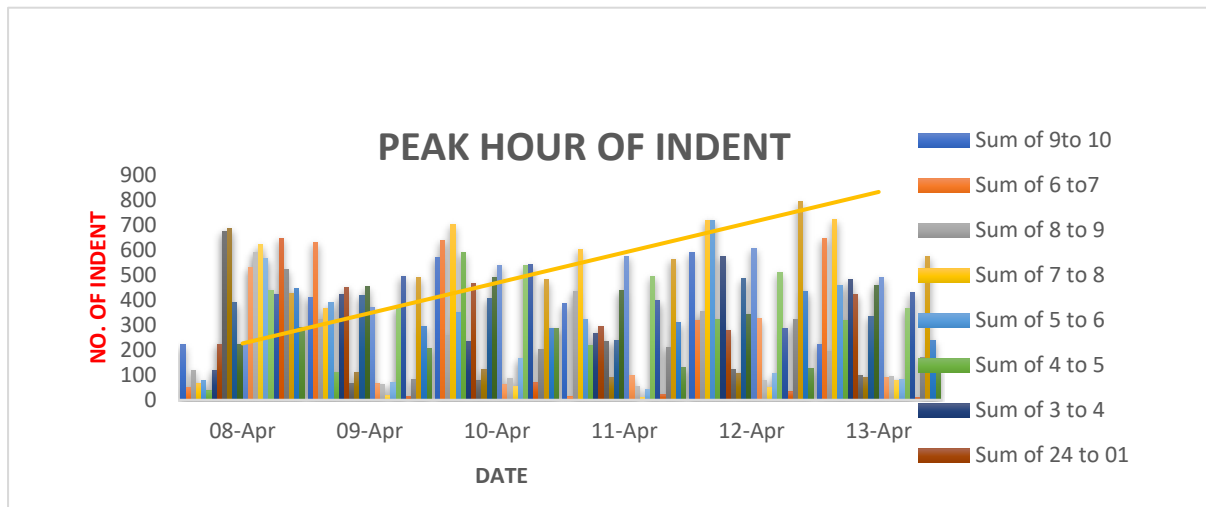
DAYWISE INDENTS



According to data Tuesday and Wednesday were the peak days for indents for that week

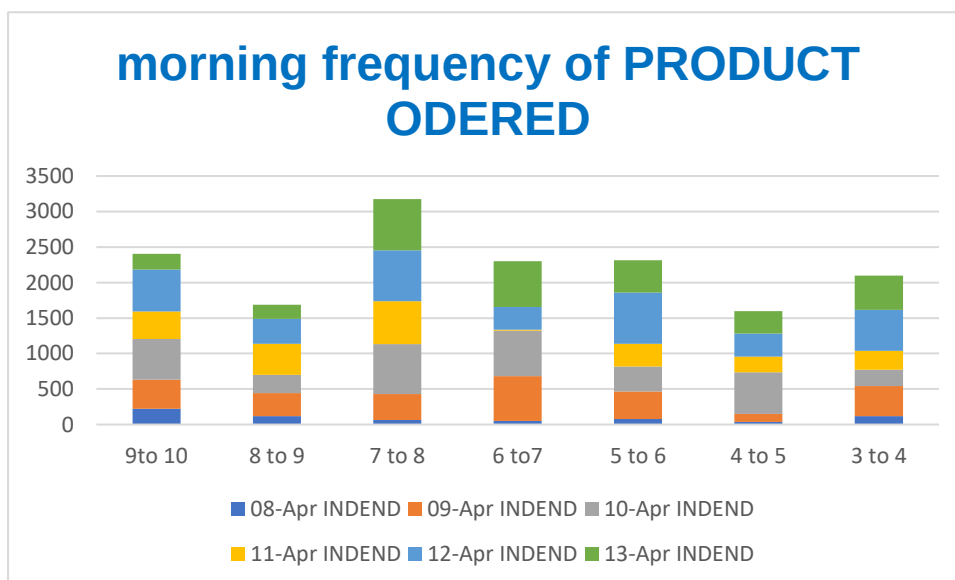
HOOR WISE INDENT FREQUENCY

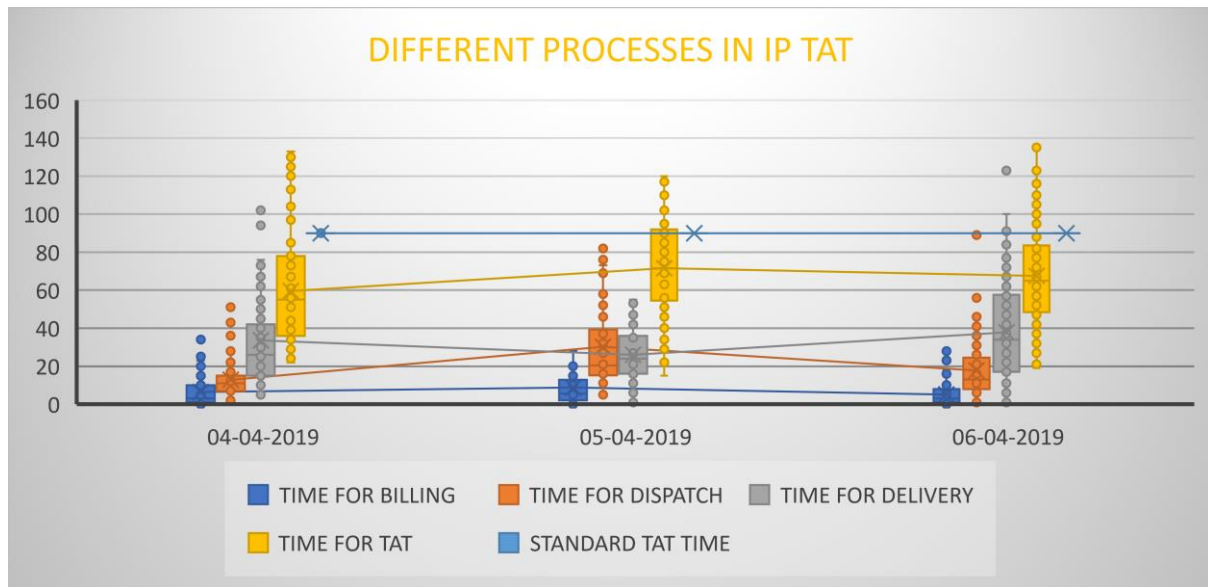
DATE	08-Apr	09-Apr	10-Apr	11-Apr	12-Apr	13-Apr
HOURS	INDEND	INDEND	INDEND	INDEND	INDEND	INDEND
9to 10	221	412	572	386	591	224
8 to 9	120	323	259	435	354	196
7 to 8	65	366	702	604	719	721
6 to7	52	631	639	13	319	648
5 to 6	77	389	349	324	720	457
4 to 5	37	112	589	220	322	319
3 to 4	119	422	233	266	574	483
24 to 01	224	452	468	295	280	424
23 to 24	675	67	77	235	122	97
22 to 23	687	109	122	91	106	91
21 to 22	389	419	408	240	487	336
20 to 21	223	453	491	438	343	459
2 to 3	221	371	540	576	606	491
19 to 20	532	65	63	97	326	90
18 to 19	591	63	88	55	79	94
17 to 18	624	17	55	10	49	78
16 to 17	439	373	537	495	512	367
15 to 16	568	69	165	44	106	81
14 to 15	422	495	544	398	286	432
13 to 14	648	15	70	23	33	12
12 to 13	524	83	201	211	321	171
11 to 12	428	492	481	563	793	574
10 to 11	445	296	286	310	436	240
1 to 2	292	206	287	129	126	137



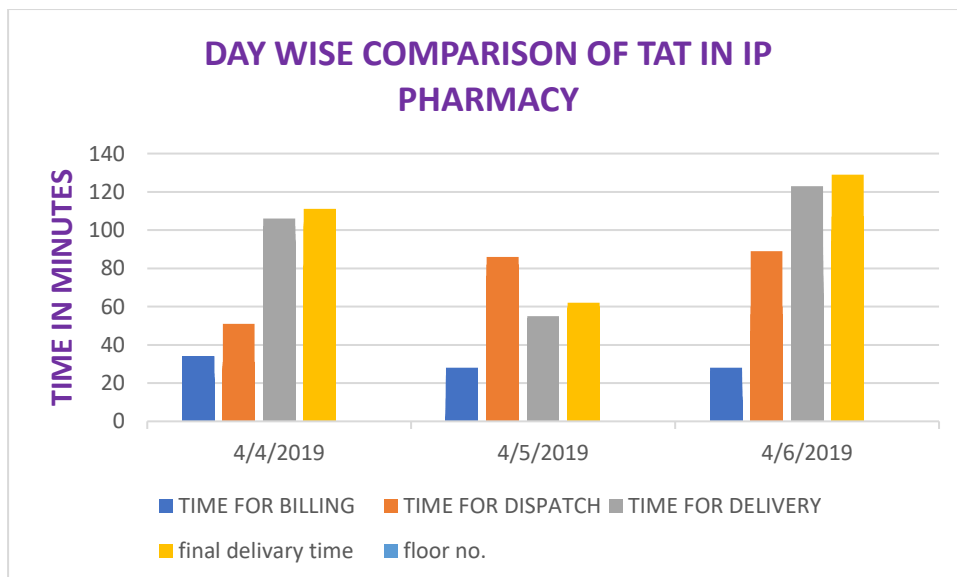
We can see in the table and in graph that the highest number of indents were received between 7 AM to 8 AM. So that is the busiest time of the day.

And 12 AM to 1 AM is the time where highest number of indents are received by the IP pharmacy.



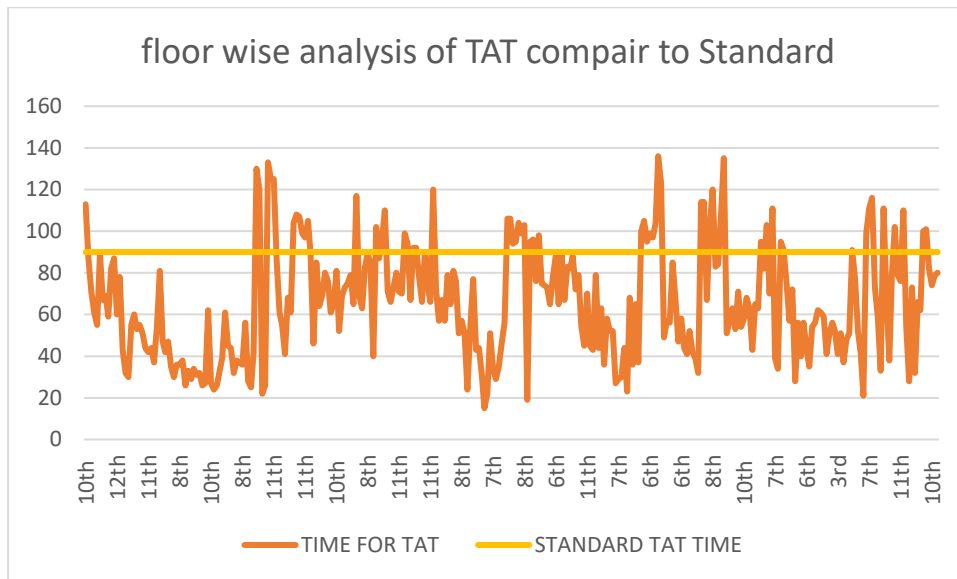


- The Standard average TAT for IP pharmacy is 90 min according to NABH.
- As we can see that dispatch time and delivery time is more than expected but overall average TAT for IP pharmacy is 66 min with some outliers
- Because of the pneumatic delivery system, the TAT has been in control.

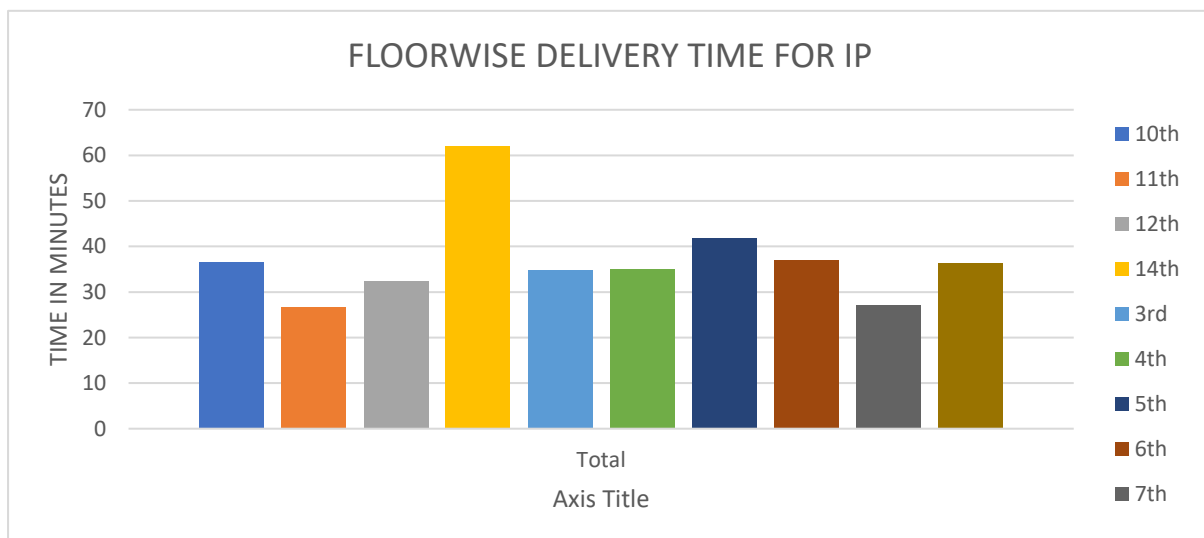


- As we can see that delivery time and dispatch time is highest in all these three days of observation

- And some days the dispatch time is more than delivery time which is not a good sign for optimum delivery system.

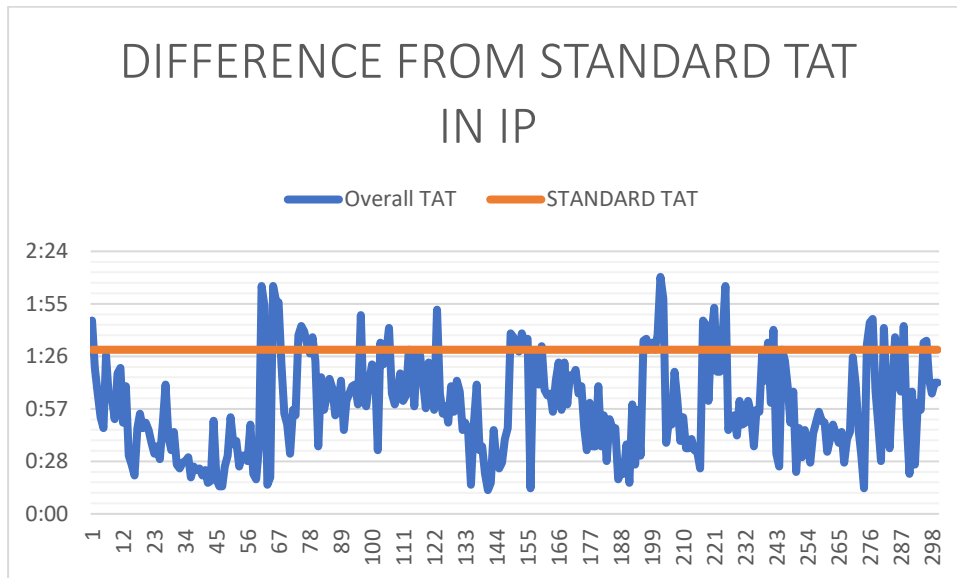


- From above graph we can interpret the TAT for each floor And compare that with standard time for TAT.
- We can see that 10 TO 15 % OF indents go above the standard timing.



- We can see here that on 10th, 11th and 14th floor TAT is very high

- So, to reduce the timings we can always optimise the use of pneumatic system for delivery and must be on time and accurate for the indent billing and dispatching.



- ❖ If we compare to standard overall TAT of IP pharmacy is very good
Yes, some outliers are always there but we can correct them by doing all the intermediate processes on time and use the system optimally.

❖ RECOMMENDATION AND CONCLUSION

✓ FOR OP PHARMACY



✓ IMPLEMENTATION FOR IP PHARMACY

1. Indent should be printed and dispatched immediately as they arrive in the system so that attendants do not have to wait for them.
2. Packed indent should be kept in a separated bin/bucket so that attender does not need to find for their indent.
3. Return to stock should be done every couple of hours to avoid high work
4. A separate bin should be provided for return to stock also.
5. Double entry system should be done by both sides to avoid pneumatic errors.
6. we should send the packed indent as soon as possible to their respective wards.
7. Nursing department should be provided proper knowledge about medication so that can reduce the medication error while sending indent electronically.
8. Optimum item should be written in the indent so that can reduce the medication return to IP departments.

❖ **REFERENCES**

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Zydus
Hospitals
A Complete Hospital

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PROJECT REPORT-2

ABSTRACT

Inventory control of drugs plays a pivotal role in hospital management. Drug inventory control of hospital pharmacy is very essential to provide continuous supportive services. The inventory management of drugs is very essential, as it is adversely affected by the consumption rate and purchasing cost of drugs. Vital drugs are necessary to keep in stock to preserve the precious human life. In this paper an attempt has been made to categorize the drugs by using ABC and VED analysis. Then, combined ABC-

VED analysis was performed and the comparisons of results were presented. The result showed that combined ABC-

VED approach is more effective in drug inventory management of a pharmacy store.

INTRODUCTION

- Pharmacy stores are very necessary for the hospitals as it provides supportive services to the hospitals. The need of pharmacy store increases with the growth of hospital in size. No hospital can exist without pharmacy store. As the resources are limited, there is need to utilize the existing resources appropriately. The aim of hospital pharmacy management is to maintain the continuous supply of drugs throughout the time. More number of patients can be served with improved drug management in case of rational drug.
- Literature revealed that approximately one-third of annual hospital budget is spending on purchasing the drugs and some other supplies. So, there is a need to organize and manage the pharmacy store in such a way which gives efficient clinical and administrative services.
- Scientific methods should be used to maximize the return from investment at minimum cost. Each drug may be considered critical and there is a necessity to supply very high level of service. Thus, the management must make efficient policies of drug management for normal operating conditions to meet the demand flu

tuations. High cost and consumption drugs come in priority which causes great clinical and economic impact. At beginning, it is important to identify most costly drugs.

- Pharmacy inventory management is a complex but critical process within the healthcare delivery system. Without adequate pharmacy inventory management practices, hospitals run the risk of not being able to provide patients with the most appropriate medication when it is most needed. Additionally, pharmacies' dispensing patterns and drug selection choices may have a direct effect on the affordability of care. Utilizing drugs that are non-contracted or not on the formulary may be costlier to the patient or may result in a lower than expected reimbursement. In addition to patient safety and financial considerations, stringent regulatory requirements pertaining to drug traceability, inventory reporting and inventory management elevate the importance of maintaining effective control over drug inventories in today's ever-expanding healthcare compliance environment. Pharmacies can control several factors within the pharmacy inventory management and pharmacy revenue cycles that can support better outcomes for patients and enhance the bottom line for facilities. This whitepaper provides perspectives on leading practices and internal controls pertaining to: procurement, charge description master maintenance, tracking systems, traceability, storage, disposal and segregation of duties. These control mechanisms can provide a basis for consistent quality, better financial performance and improved regulatory compliance when implemented appropriately and adhered to during day-to-day operations.
- American Production and Inventory Control Society define inventory management as the branch of business management concerned with planning and controlling inventories. The major aims of hospital inventory management and healthcare supply chains research is to reduce healthcare cost without sacrificing the quality of service to the patient by improving efficiency and productivity of healthcare system.
- Inventory management has a significant role in the supply chain. Among various SCM issues, inventory management is a greater extent relevant to the entire supply chain. Inventory management has been recognized as one of the most important functions that has huge impact on their overall performance. Supply chain inventory management is focused on end-customer demand and aims at improving customer service while lowering cost

❖ . TYPES OF INVENTORY ANALYSIS

ABC- Always better control-

ABC analysis is a method for classifying items based on their importance. It is also defined as the “separation of the vital few from the trivial many”. A small number of drugs on the list of pharmaceutical drugs have the highest amount of consumption and at the same time are the most expensive drugs as well. This analysis is based on the Pareto principle, according to which goods can be classified to three groups of always (A), better (B), and control (C) based on their importance. Group A includes important items in terms of price value and accounts for 70% to 80% of the cumulative value (cost) of the annual budget of the pharmacy (10% to 15% of total items). Group B items have a moderate price value and form approximately 15% to 20% of the cumulative value (cost) of annual budget allocated for the purchase of drugs and consumables (20% to 25% of total items). Group C includes consumable items with the lowest price value, which account for only 5% to 10% of the total cumulative cost of drugs and consumable items (65% to 70% of total items) (8-16). The restriction of ABC analysis is that it is only based on the financial value and the rate of use of medicines; whereas, in a hospital, a drug with low price and low consumption may be vital, and if not available, it can lead to major problems in providing services. As a result, their importance cannot be ignored merely because they are not in group A. Therefore, another parameter is considered.

The VED analysis is based on the critical value and cost of the shortage of items. Based on their importance, items are categorized to three categories of **vital, essential, and desirable**. The provision of services to the patients will encounter serious constraints in the event of a shortage of vital medicines, even for a very short period. If the essential drugs are not available for more than a few days to a week, the hospital's function will be negatively affected. The shortage of desirable drugs (non-essential) will not affect the overall functioning of the hospital, even if the shortage of drugs is prolonged.

ABC-VED Matrix Analysis-The ABC-VED matrix was designed by cross-tabulating of ABC and VED analyses. From the resultant combination, the three categories were classified as first, second, and third categories (I, II, III). The first category (category I)

includes subgroups of AV, AE, AD, BV, and CV drugs. The subgroups BE, CE, and BD make up the second category (category II), and the subgroup CD forms the third category (category III). In these subgroups, the first letter indicates its status in the ABC analysis and the second letter denotes the status of the item in the VED analysis. A combination of ABC and VED (ABC to VED Matrix) analyses can effectively have a significant control over the supply of pharmaceutical needs.

The acronym **XYZ** hides to the level of predictability of the predictability of the object being analyzed. This index is made to measure by the coefficient of variation that characterizes the measure of the scatter dates around the average value. The coefficient of variation – is a relative measure, which does not have of the specific units of measurement. It's suffice informative. Even per se. BUT! The tendency, seasonality dynamics significantly increase the rate predictability. As a result, is reduced the rate predictability. This error may involve to wrong decisions. This is a huge minus of XYZ-method. It's nevertheless. There are possible objects for analysis: volume of sales, number of suppliers, revenue, etc. More often this method is used for determining the goods for which there is the strong demand.

The criteria for the classification and characteristic of the groups:

«X» - 0 - 10% (the coefficient of variation) - goods with the strongest demand.

«Y» - 10 - 25% - goods with volatile sales.

«Z» - 25% - goods having random demand.

FSN ANALYSIS- This acronym stands for Fast-moving, Slow-moving and Non-moving inventory items. The purpose of FSN analysis is to consider quantity, the rate of consumption of products and how often they are issued or used and to use this information to guide decisions about placement in the warehouse (considering picking and packing to reduce time and labour), frequency of reordering or even phasing out of certain items. For FSN analysis to be successfully implemented, it requires a considered analysis of which products fall into each of these categories. This is done by ascertaining certain pieces of information such as the average stay in inventory and consumption rate of items and identifying a period for a analysis according to the following formulae:

Average stay = cumulative no. of inventory holding days [or unit of time] ÷ (total quantity of items received + opening balance)

Consumption rate = Total issue quantity ÷ Total period duration

Once the average stays and consumption rates have been calculated for each product in inventory, the cumulative average stays and cumulative consumption rates can be calculated with subsequent percentages of the total derived from which F, S and N statuses can be assigned.

High, Medium and Low Classification: The High, medium and Low (HML) classification follows the same procedure as is adopted in ABC classification. Only difference is that in HML, the classification unit value is

the criterion and not the annual consumption value. The items of inventory should be listed in the descending order of unit value and it is up to the management to fix limits for three categories. The HML analysis is useful for keeping control over consumption at departmental levels, for deciding the frequency of physical verification, and for controlling purchases.

Procurement department is more concerned with prices of materials, so this analysis helps them to take the decisions such as, who will procure what based on the hierarchy and price of material.

LITERATURE REVIEW-

“ Ebrahim Hazrati 1, Babak Paknejad 2, Ali Azarashk 3 and Morteza Taheri-

The ABC and VED (i.e. vital, essential, desirable) analysis of the pharmacy of Imam Reza Educational Hospital was carried out to determine the categories of medicines, which necessitate strict control. The annual consumption and cost of each item of medicine for the year 2016 were analysed and cost control programs, i.e. ABC, VED and ABC-

VED matrix analysis, were used. The drug formulary of the pharmacy included 597 items. The annual drug expenditure on items issued was 13 108,365,188 Rials. The ABC analysis showed that 5.7%, 11.2%, and 83.1% of items belonged to category A, B, and C, respectively, conforming 74.873%, 20.089%, and 5.038% of ADE of the pharmacy. The VED analysis revealed 10.55%, 19.43%, and 70.02% of items as V, E, and D category items, respectively, conforming 23.20%, 47.91%, and 28.89% of ADE of the pharmacy. On ABC-

VED matrix analysis, 15.24%, 20.44%, and 63.32% of items were defined to be category I, II, and III items, respectively, conforming 83.76%, 13.54%, and 2.70% of ADE of the pharmacy. In conclusion, scientific inventory management tools are needed to be applied on a routine basis for efficient management of pharmacy stores, as they contribute improvement in patient care and judicious use of resources”

❖ **RESEARCH QUESTION**

Is the hospital pharmacy comply with inventory management criteria of hospital regulations?

❖ **OBJECTIVES**

1. To maintain a minimum investment in inventories to maximize the profitability.
2. To maintain an optimum size of inventory for efficient and smooth running of Hospital pharmacy.
3. To evaluate the inventory coastwise
4. To forecast consumption of drugs on the bases of previous sales.

❖ **DATA COLLECTION AND METHODOLOGY**

A Prospective Observational study in the In-Patient Pharmacy Department of Zydus hospital, Ahmedabad. Sampling was done by using nonprobability convenient sampling method. Both primary and secondary data has been used in the study. The secondary data was obtained from the HINAI WEB CONNECTED CARE SOFTWARE, which was used in the pharmacy. –

Secondary data of last three months were collected by HMIS (HINAI). Data was transferred in MS EXCEL and perform different inventory management techniques like ABC, VED, XYZ and HML analysis. The collected data was analyzed using MS Excel and Power-BI. Prior to the data collection, approval to conduct the study was obtained from HOD of supply chain department and HR department.

Flow chart of Methodology

Step 1: **Data Collection**- consumption report is collected from HMIS.

Step 2: **ABC analysis** -

ABC analysis was used to categorize the drugs according to their relative importance. Three

categories are formed in which category A contained high value drugs whereas category B contained intermediate and category C contained lower value drugs.

Step 3: VED analysis -

VED analysis was performed to categorize the drugs by their critical value. Drugs that are more critical and act as lifesaving comes under category V whereas essential drugs whose importance is lower than V comes under category E and drugs which are used for minor or limited illness comes under category C.

Step 4: Coupling of ABC and VED analysis A (3×3) matrix was formed by the coupling of ABC and VED analysis.

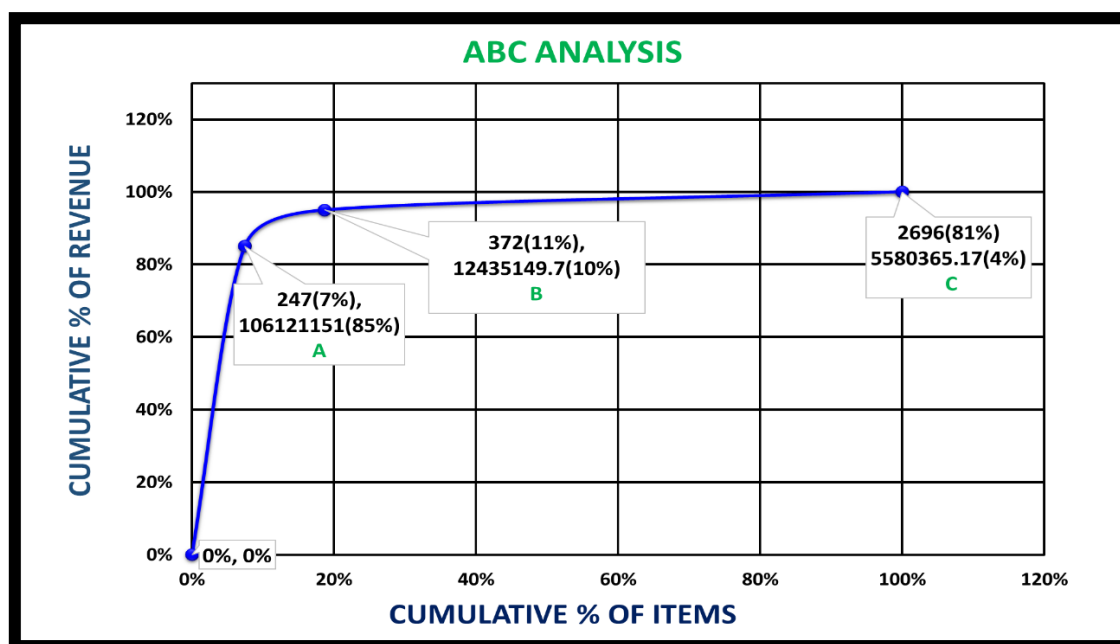
❖ DATA ANALYSIS AND INTERPRETATION

- **ABC ANALYSIS**

	STANDARD BY NABH	
CLASS	QTY	REVENUE
A	10	70
B	20	20
C	70	10

- As we can see in the table NABH has set up certain criteria for the inventory in hospital pharmacy.
- For quantity and revenue both.

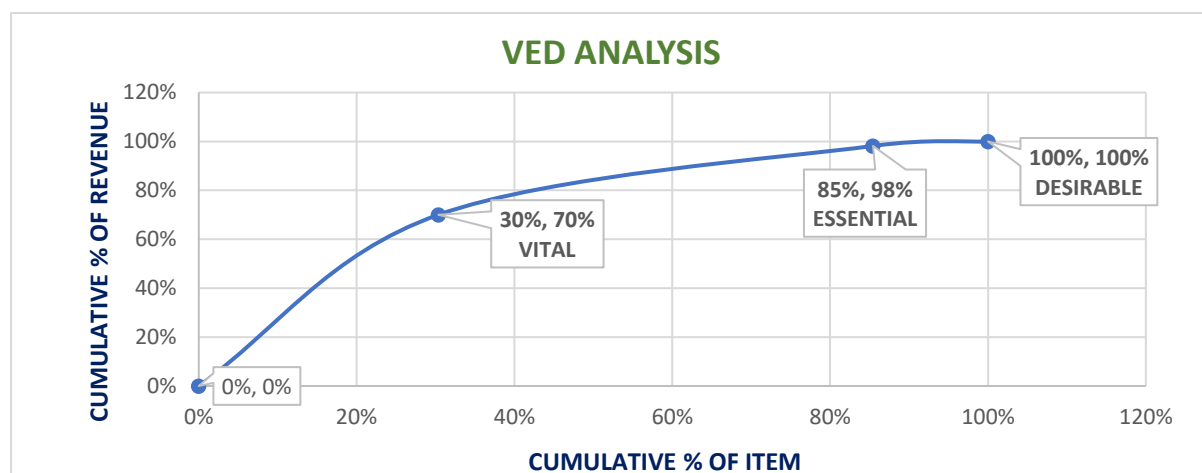
CLASS	QTY	%QTY	CUMULATIVE% OF ITEM	REVENUE	%REVENUE	CUMULATIVE% OF REVENUE
A	247	7%	7%	106121151	85%	85%
B	372	11%	19%	12435149.7	10%	96%
C	2696	81%	100%	5580365.17	4%	100%
TOTAL	3315	100%		124136666	100%	



The graph of ABC analysis shows that 7% (247), 11% (372) and 81% (2696) items were found to be in A, B and C categories respectively whose expenditure of three months was found to be 106121151, 12435149.7 and 5580365.17 respectively. The cut-offs were not exactly at 70/20/10% and differed marginally, which is permissible.

- VED ANALYSIS**

VEDCLASS	QTY	%QTY	CUMULATIVE % OF ITEM	REVENUE	%REVENUE	CUMULATIVE % OF REVENUE
VITAL	611	30%	30%	47638645.06	70%	70%
ESSENTIAL	1108	55%	85%	19146284.86	28%	98%
DESIRABLE	293	15%	100	1255965.129	2%	100%
TOTAL	2012	100%		68040895.05	100%	

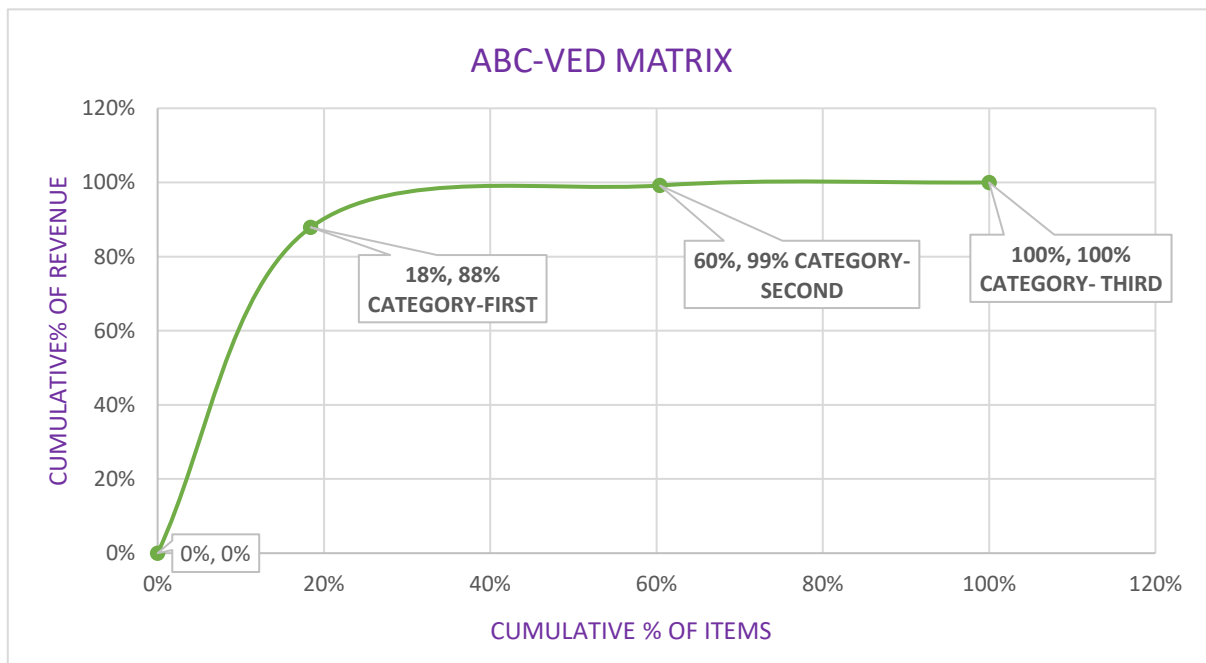


CATEG ORIES	CLASS	QUANTITY	%QTY	CUMULATIVE %OF ITEMS	REVENUE	%reve nue	CUMULATIVE %REVENUE
CLASS- 1	AV	44	8%	8%	23072155.75	34%	34%
	BV	23	4%	12%	2937997.173	4%	38%
	CV	6	1%	13%	175456.0644	0%	38%
	AE	32	6%	18%	31785153.9	47%	85%
	AD	2	0%	18%	1943640.672	3%	88%
CLASS- 2	BD	1	0%	19%	92149.98	0%	88%
	CE	175	30%	49%	2962520.065	4%	92%
	BE	68	12%	60%	4647767.975	7%	99%
CLASS- 3	CD	230	40%	100%	556689.0537	1%	100%
		581	100%		68173530.63		

The VED analysis graph shows that 30% (611) items ,55% (1108) items and 15% (293) items were found to be from V, E and D class respectively whose expenditure of three months was found to be 70% (47638645.06),28% (19146284.86) and 2% (1255965.129) respectively. There are 2012 items in drug formulary whose expenditure was 68040895.05.

ABC- VED MATRIX

CLA SS	QUANT ITY	%Q TY	CUMULATI VE% QUANTITY	REVEN UE	%REVE NUE	CUMULATIVE%R EVENUE
CLA SS1	107	18%	18%	5991440 3.6	88%	88%
CLA SS2	244	42%	60%	7702438 .02	11%	99%
CLA SS3	230	40%	100%	556689. 054	1%	100%
TOT AL	581			681735 30.6	100%	

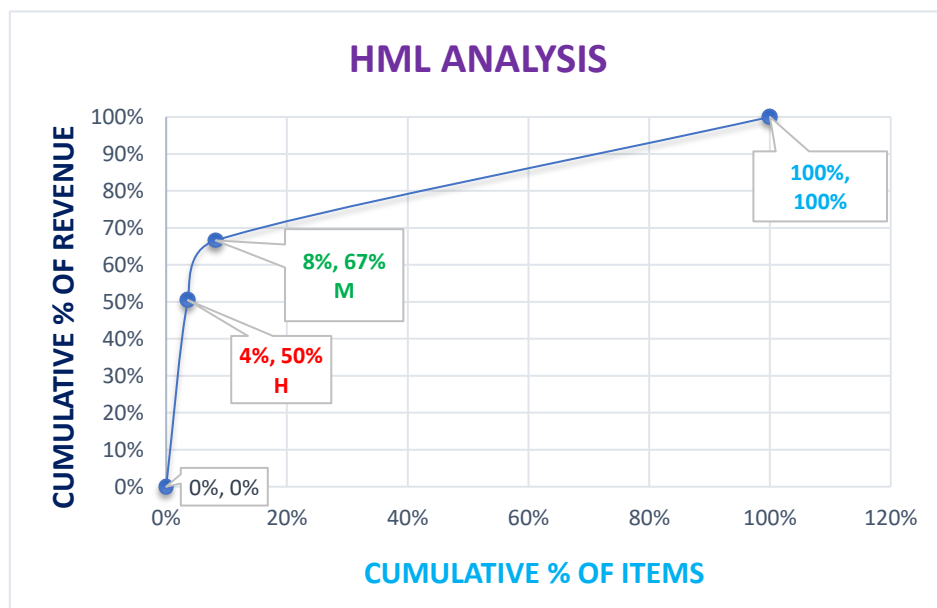


In a combination of ABC and VED analysis, the resultant matrix makes it possible to focus on 107 (18%) items are belonging to category I for strict managerial control as these items a

re either expensive or Vital. The quarterly expenditure of these items was 88% of total expenditure. Class 2 is having 244 (42%) items whose quarterly expenditure was 7702438.02 (11%) and class 3 is having 230 (40%) of items whose quarterly expenditure was 556689.054 (1%) of total expenditure

HML- ANALYSIS

CLASS	ITEMS	% OF ITEMS	CUMULATIVE % OF ITEMS	COST	% OF COST
H	18	4%	4%	51270.17189	50%
M	23	5%	8%	16390.06968	16%
L	459	92%	100%	33935.10273	33%
	500	100%		101595.3443	100%



❖ As we know that inventory of VED report has been classified into three sections

s

- 1) High cost inventory
- 2) Medium cost inventory
- 3) Low cost inventory

So, from analysis we found that we have 4% of items in high cost list, 5% of items in medium and 92% of items in the low-cost list.

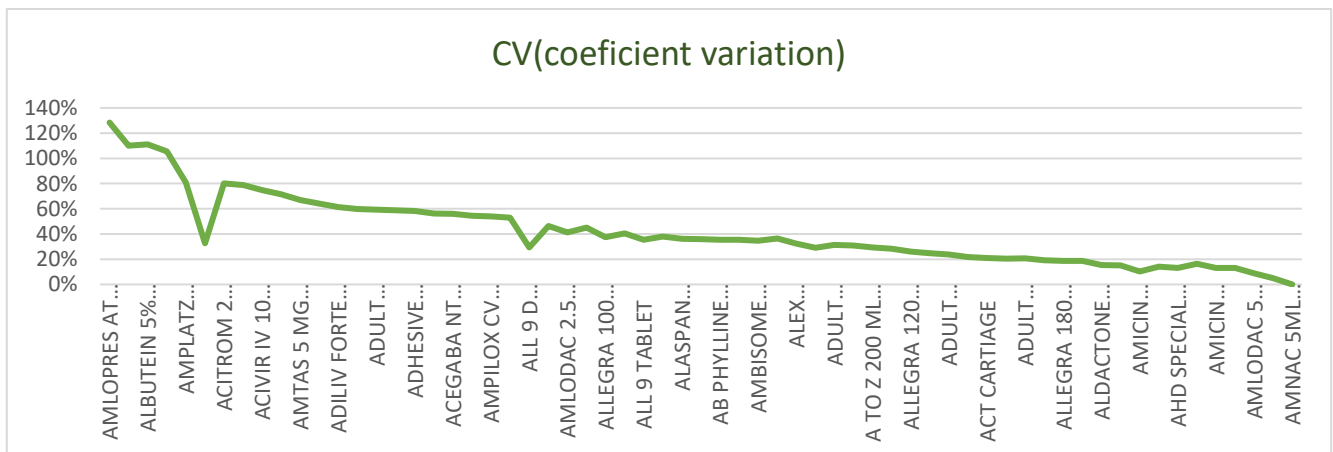
XYZ ANALYSIS

- XYZ analysis is done to identify the fluctuations in item consumption.
- After identifying the most fluctuated items we can focus more on the item in purchasing and other inventory issues.

Item Name	CV
AMLOPRES AT TABLET 15'S STRIP	128%
ACTIBILE SR 450MG TABLET	110%
ALBUTEIN5%250ML SOLUTION	111%
ACTIBILE 300MG TABLET	105%
AMPLATZ RENAL DILATOR SET *	81%
ACTIV 9-AD TAB	33%
ACITROM 2 MG TABLET	80%
ALLEVYN 17CMX17CM (SACRUM)	79%
ACIVIR IV 10 ML BOTTLE	75%
AMPHOTRET 50MG INJ	71%
AMTAS 5 MG TABLET	67%
ACITROM 4 MG TABLET	64%
ADILIV FORTE TABLET	61%
AMIKA PUMP BAG SET(REF:7751743)	60%
ADULT DIAPERS PANTS 10S M-L (FRIENDS)	59%
ACNEMOIST 60GM CREAM	59%
ADHESIVE BANDAGE DYNAPLAST 10CM (J&J)	58%
AMARYL M 2 TABLET	56%
ACEGABA NT 400 TAB	56%
ACE COLLAR ADULT PERFIT	54%
AMPILOX CV 1.2GM INJECTION	54%
ALPRAX 0.5MG TABLET	53%

ALL 9 D CAPSULES	29%
ADHESIVE BANDAGE DYNAPLAST 10CM	46%
AMLODAC 2.5 MG TABLET	41%
AMARYL M 1 TABLET	45%
ALLEGRA 100 ML SYRUP	37%
ADESAM 200 MG TABLET	40%
ALL 9 TABLET	35%
ACITROM 3 MG TABLET	38%
ALASPAN 10MG TABLET	36%
ADNEON 2 ML INJECTION	36%
AB PHYLLINE 100 MG CAPSULE	35%
AKYNZEO ORAL USE CAPSULE	35%
AMBISOME 50MG INJECTION	35%
AMBRODIL S 100ML SYRUP	36%
ALEX LOZENGES 10'S STRIP	32%
ACITROM 1 MG TABLET	29%
ADULT DIAPERS 10S L (FRIENDS)	31%
ADULT DIAPERS 10S M (FRIENDS)	31%
A TO Z 200 ML LIQUID	29%
ANOBLISS CREAM 30GM	28%
ALLEGRA 120 MG TABLET	26%
AMIODON 3 ML INJECTION	25%
ADULT DIAPERS 10S XL FRIENDS	24%
ALLEGRA M TABLET	22%
ACT CARTIAGE	21%
ACE LAPAROSCOPIC HARMONIC 5MMX36CM (REF-HAR36) (ETHICON)*	20%
ADULT DIAPERS PANTS 10S L-XL (FRIENDS)	21%
A TO Z TABLET	19%

ALLEGRA 180 MG TABLET	19%
ALDACTONE 25 MG TABLET 15'S	19%
ALDACTONE 50 MG TABLET	15%
1/4 PRECUT TUBING (B.L)	15%
AMICIN 250MG INJECTION	10%
ADRIAMYCIN RTU 50 MG INJECTION	14%
AHD SPECIAL 100ML	13%
ALCOHOL SWAB	16%
AMICIN 500MG INJECTION	13%
ALBUREL T 20% 100ML INJECTION	13%
AMLODAC 5 MG TABLET	9%
ALPRAX 0.25MG TABLET	5%
AMNAC 5ML EYE DROPS	0%
Average	42%



- Hear we have done XYZ analysis of products starting from “A”.
- So, we can see that which item shows maximum fluctuation in consumption.
- Here CV is coefficient of variation.

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