

**Summer Training at
Care Institute of Medical Sciences, Ahmedabad
(April 3 to June 2, 2017)**

**Six Sigma Approach to Reduce Medicine Delivery Time of IP
Pharmacy**

**By
Nivedita Purohit**

**Under the guidance of
Dr. Suresh Joshi**

**MBA Hospital & Health Management
2016-2018**


**Institute of Health Management Research
The IIHMR University, Jaipur
2017**

CERTIFICATE

This is to certify that **Dr. Nivedita Purohit** has undergone summer training in **Care Institute Of Medical Sciences, Ahmedabad** from 6th April to 7th June 2017.

The candidate herself/himself completed the project assign to his/her during summer training. Her approach to the project was sincere and proactive. This summer training is in partial fulfillment of the course requirement recommended for the award of MBA in Hospital and Health Management.

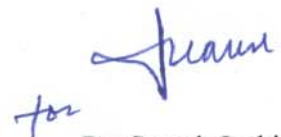
I wish her success in all her future endeavors.



Col. (Dr.) Ashok Kaushik

Dean (Academic & Student Affair)

The IIHMR University, Jaipur



Dr. Suresh Joshi

Adjunct Professor

The IIHMR University, Jaipur

Ref: CIMS/TIC/17-18/01

7th June 2017

Certificate of Internship

To Whomsoever It May Concern

This is to certify that Ms. Nivedita Purohit, a student of "IIHMR University, Jaipur" has successfully completed her training in Quality and Assurance Department from April 6, 2017 to June 7, 2017 at CIMS Hospital, Ahmedabad. She has done her project on "Six Sigma Approach to Reduce Medicine Delivery Time of IP Pharmacy.

She was found good in conduct and behavior.

We wish her all the very best for her future endeavors.

For,

CIMS Hospital Pvt. Ltd.



Jaimin Gajjar
Manager HR





Dr. Lubna Mansuri
Associate Head – Quality and Assurance

Acknowledgement

I express my heartfelt gratitude towards my mentor Dr. Suresh Joshi for guiding me throughout my summer training and project.

I would like to thank Mrs. Bela Panchal, Head HR, and Ms. Radhika Joshi, Senior Executive HR for allowing me to do my summer training at CIMS, Ahmedabad.

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I would like to thank Mrs. Nisha Joshi, Mr. Abhinav Sahay, and Mr. Uttam Mandal for helping me learn and providing support throughout my training.

I would also like to convey deep regards to Mr. Brijesh Modi and Mr. Piyush Thakkar to allow me in pharmacy and work on my project.

I convey my heartfelt regards to Nursing In-charges, Senior nurses for helping me through the project processes and helping in training of staff nurses.

I am thankful to all the staff at Pharmacy for being patient and helpful during my project.

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Introduction to Hospital -

CARE INSTITUTE OF MEDICAL SCIENCES is located in Ahmedabad, Gujrat.

It is accredited by NABH, NABL, JCI. It is a multi-specialty hospital and provides world class care to its patients.

The hospital was founded in 2010.

Mission and Vision:

Mission:

Care, Innovation, **M**anage, **S**ave Lives

Care with **I**nnovation to **M**anage and **S**ave lives.

Vision:

To be one of the most trusted hospital in India by providing personalized care for best patient experience.

Infrastructure

Hospital has 2 buildings CIMS EAST AND CIMS WEST.

CIMS EAST -

Floor one:

- Health Checkup
- OPD
- X Ray
- ECG
- Blood Collection
- Primary Check-Up
- Consultation Areas
- Billing
- Pharmacy
- Report Collection
- TMT
- Endoscopy
- Day- Care
- A Corridor to West Wing

Floor two:

- Gynae OPD
- Gynecology Consultation Area,
- Single Rooms

- NICU, PICU
- Gynae OT
- IVF Room
- A Corridor to West Wing

Floor three:

- ❖ Management
 - Human resource
 - Quality Assurance
 - Accounts department
 - Project department
 - Clinical care
 - Purchase and Supply Chain Department
 - Care At Home
 - Meeting Rooms
 - Management lounge
- ❖ Department of Laboratory Medicine
 - Microbiology
 - Pathology
 - Blood storage

Floor four:

- General Ward
- Twin Sharing
- HDU

Floor five:

- Single rooms
- Suite rooms

Floor six:

- Intensive care unit
- Operation theatre

BASEMENT (1,2,3)-

Parking

CIMS WEST

Ground floor:

- OPD Reception
- Consultation Area
- Radiology
- Radial Lounge
- Emergency /Isolation

- Physiotherapy/ Rehabilitation
- Admission and Billing
- Blood Collection
- Waiting Area
- Staff Library
- Help desk

First Floor:

- General ward
- Dialysis
- Twin rooms
- CCU- Critical Care Unit
- Cath lab
- Dental Department
- Chemotherapy

Second Floor:

- SICU- Surgical Intensive Care Unit
- OT complex- CTOT (Cardio- Thoracic Operation Theatre)
- Knowledge Process Area
- Rooms

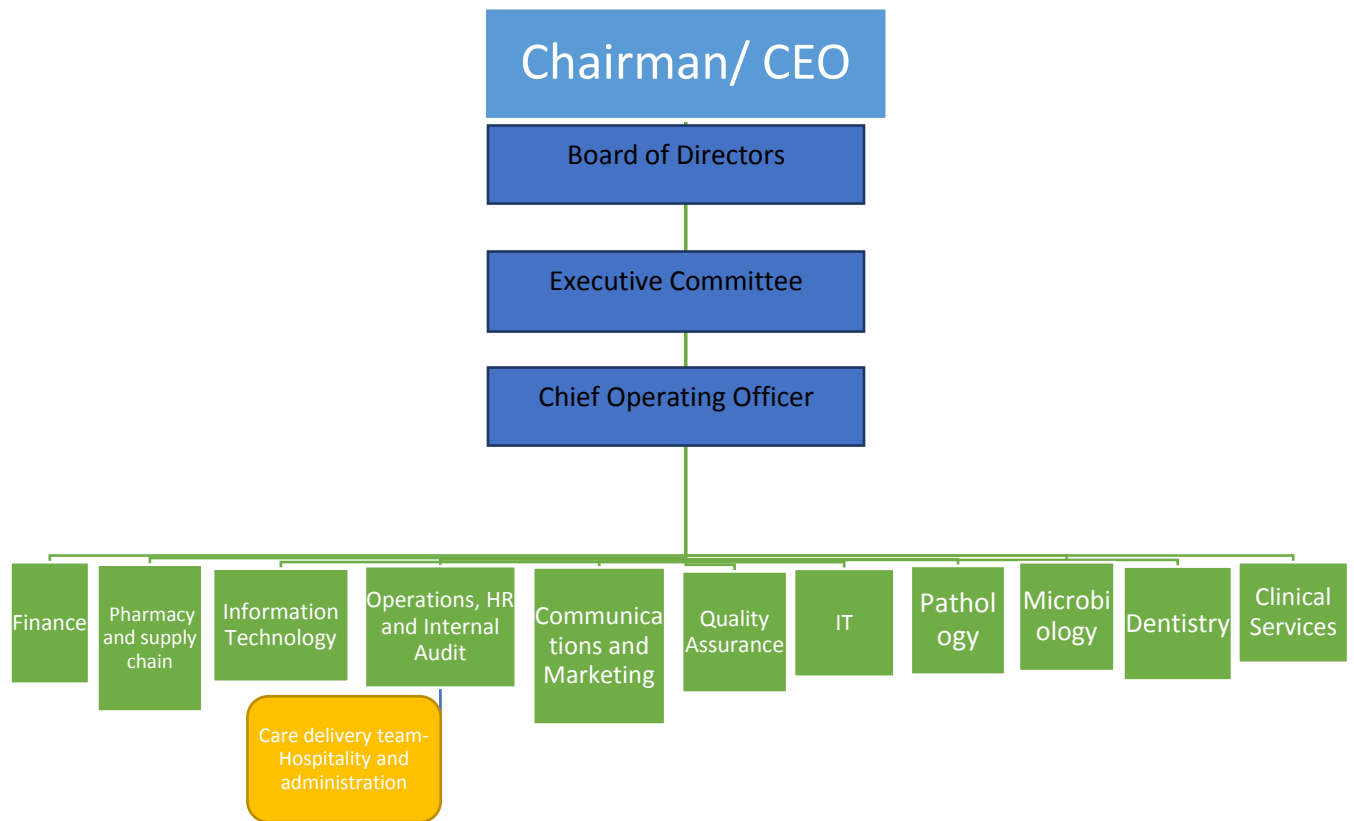
Basement 1:

- CIMS Cancer
- In Patient Pharmacy
- CSSD
- Linen Department
- Kitchen and Dietetics
- Canteen
- Dormitory
- Housekeeping
- Attendant room
- CIMS research
- Mortuary
- Bio-Medical Engineering
- CIOD

Basement 2 and 3-

- Parking

Organogram of Organization-

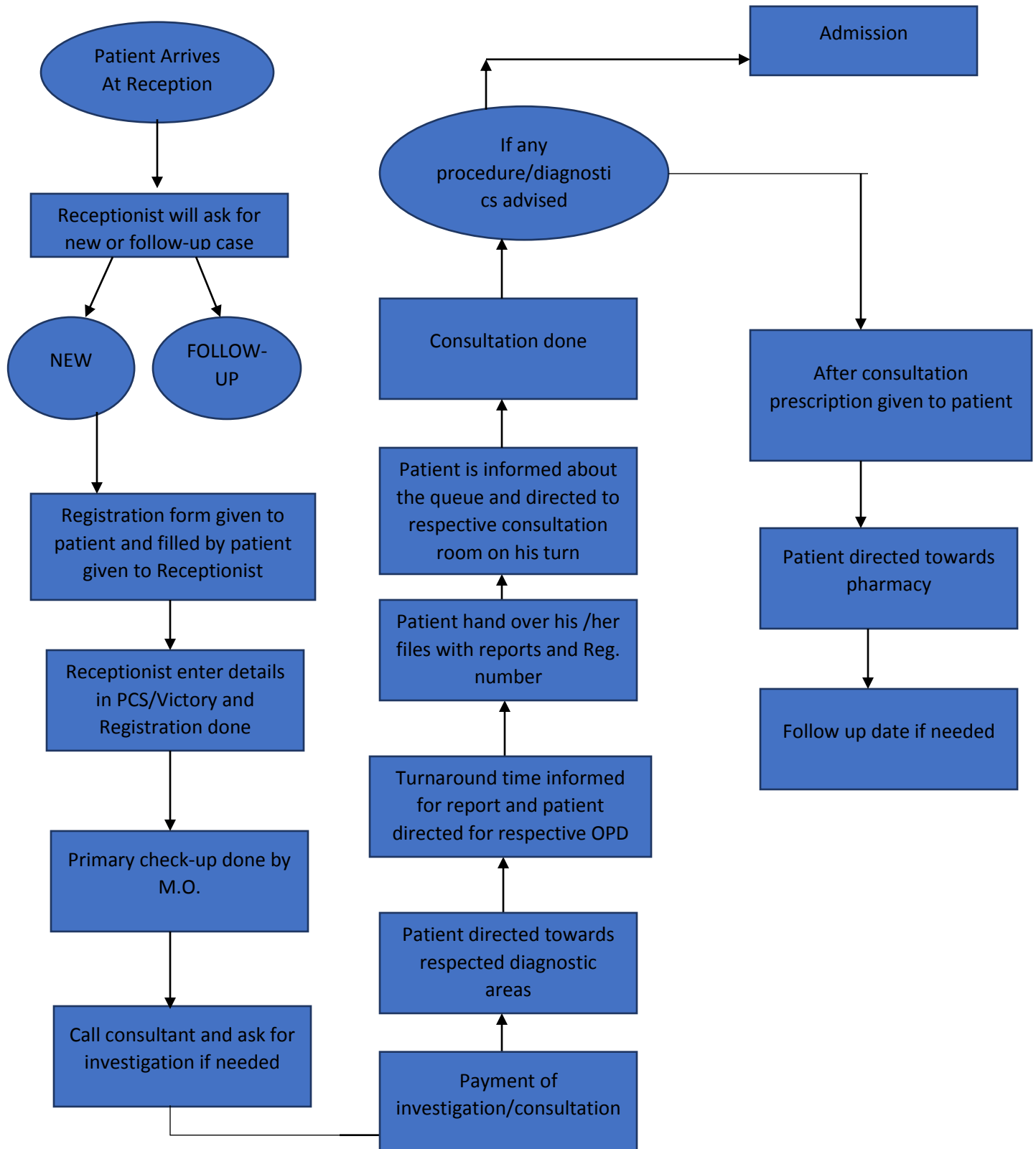


CLINICAL SERVICES

OPD- Out Patient dept.

There are 2 Out Patient Departments at CIMS.

CIMS OPD PROCESS FLOW:



Radial Lounge:

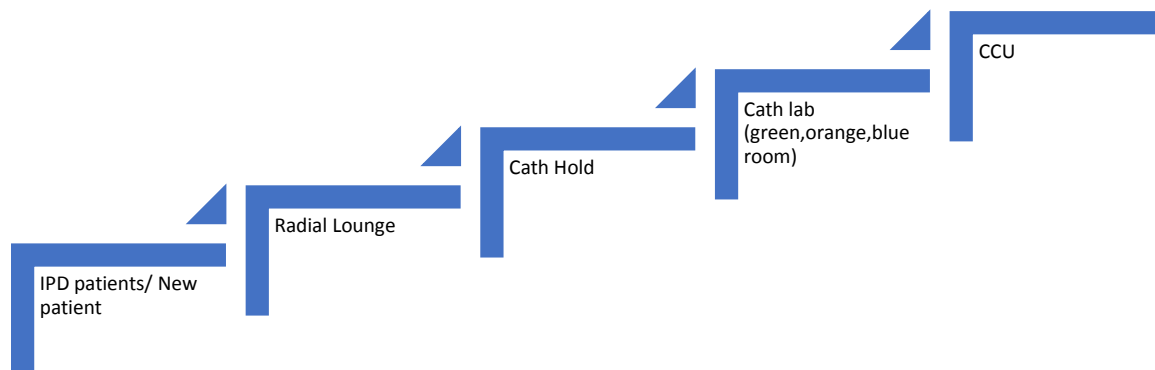
It is a new concept of providing a soothing experience during treatment. It is an area where patient is prepared for Cath-Lab procedures. It has a hotel like infrastructure and furniture. The patient area is with a couch and separated by curtains for privacy. A fall ceiling television is provided for entertainment. A call bell for each patient is available. There are 13 beds available.

Cath lab:

It handles the procedures like Angiography and Angioplasty. There are 3 rooms in which procedures take place- Green, Orange and Blue rooms with attached observation areas.

Patient is verified at each step before proceeding for operation.

Process flow:



In- Patient Wards-

The in-patient wards deal with pre-procedure preparation, follow-up care and care throughout along with nutritional care, physiotherapy, rehabilitation.

The inpatient wards are General ward east (4th floor) and west (1st floor), Pediatric ICU/ Neonatal ICU East (2nd floor), HDU east, Neutropenic Care, Sleep Lab (4th floor), Single and Suite rooms (5th floor), Intensive Care Unit East (6th floor), Critical care unit west (1st floor), Surgical ICU west (2nd floor).

EAST	Beds	WEST	Beds
NICU/PICU	14	GENERAL WARD	24
GENERAL WARD	24	CHEMOTHERAPY	4
SUITE ROOMS	4	CCU	13
GICU	19	SICU	21
SINGLE ROOMS	15	DIALYSIS	4
HDU	5	PCCU	8
TWIN SHARING	14	TWIN SHARING	20

General ward:

It has 6 beds in one room, separated by curtains for privacy. The nurse patient ratio is 1:6.

Nursing staff has 3 shifts: morning, evening, and night- 8-2-8-8.

Twin sharing:

The twin sharing rooms have 2 beds along with visitor seating area and separation by a curtain. The nurse patient ratio is 1:2.

High Dependency Unit:

It provides care to critical patients who require continuous support and care. This unit does not have visiting area. Nurse patient ratio is 1:1.

Neutropenic Care:

This provides care to patients with neutropenia (low WBC), they are provided proper isolation and care. The nurse patient ratio is 1:1.

Sleep lab:

This lab deals with patients with insomnia and those that need to be taken care and studied during night. Nurse patient ratio is 1:1.

Suites/ single rooms:

They are well furnished and comfortable rooms for giving a soothing experience during treatment of patient. The nurse patient ratio is 1:1 or 1:2 as per required.

It provides complete privacy and home like experience.

CCU AND PCCU:

Critical care unit- it has separate rooms for each patient and has a glass sliding door to separate from corridor. The patients have proper isolation and are under direct observation and care. Proper nutrition, physiotherapy and rehabilitation is provided. CCU and PCCU have specific visiting hours. Head cap and masks are supposed to be worn on visit.

SICU-

This unit deals with patients undergone surgery. Gown, head-cap, mask, and shoe cover are to be worn on visit. Each patient is separated and isolation is provided. Doctor rounds, consultants' visit is scheduled every day and medical officer is always available.

GICU-

Intensive care unit deals with patients who need intensive care. An Intensivist and MO take care along with nurses. The nurse patient ratio is 1:1 and proper isolation is maintained. All the procedures like dialysis, tracheostomy are performed bed side.

The Intensive care units are well equipped with all kinds of monitoring systems and life supporting systems.

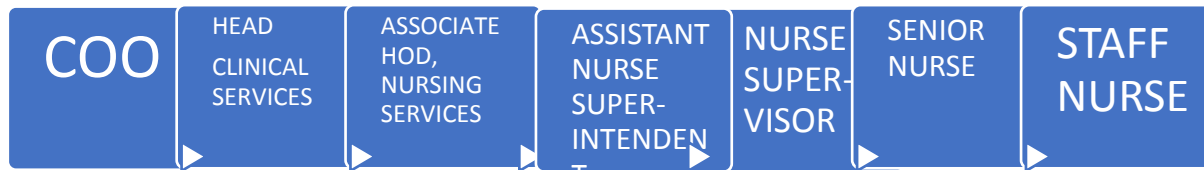
Nursing Shift:

Morning: 8 am – 2 pm

Evening: 2pm- 8 pm

Night: 8pm- 8am

Nursing Staff:



Operation Theatre:

There is General Operation Theatre Complex and Cardio-thoracic OT Complex, Gynae OT. There is OT hold area where the documentation happens and patient is prepared. Each theatre is well equipped with life support systems, lights, air condition, emergency phone, monitors, bio-medical waste systems, surgery requisites, oxygen and has in built store for emergency requirements.

Patient's identification, vitals and important details are written on the board in OT. Patient is verified while admitting to OT. Surgical Checklist is well maintained and practiced.

OT is at the top floor of east building. Security and Isolation is maintained.

There are 5 theatres in GOT, 4 theatres in CTOT and 3 in Gynae OT.

Chemotherapy:

It is at first floor in west building, the cancer patients go under chemotherapeutic treatment. According to JCI norms, nurse-patient ratio is 1:4. The department works from morning 8 to evening 8. There are only 2 shifts for nursing staff.

Health Check-Up:

This service provides different health checkup packages with different facilities. It provides good combination of tests and consultants to give patient an overview of health. During the health check-up, an attendant escorts the patient throughout the visit and breakfast and lunch is provided as procedure is long. Reports are provided on the same day. After visiting all the consultants and having review of all the tests done, the reports are handled over to patient.

Emergency:

It is open and prepared 24*7. Well defined triage zones and facilities at each bed. On call doctor available and trained nursing staff. In case of emergency in hospital, different codes are set :

Code Blue: 222 Cardiac arrest

Code Red: 200 Fire

Code Yellow: 400 Disaster

Code Pink: 500 Child Abduction

Code Black: 600 Bomb Threat

Code Grey: 444 Violence

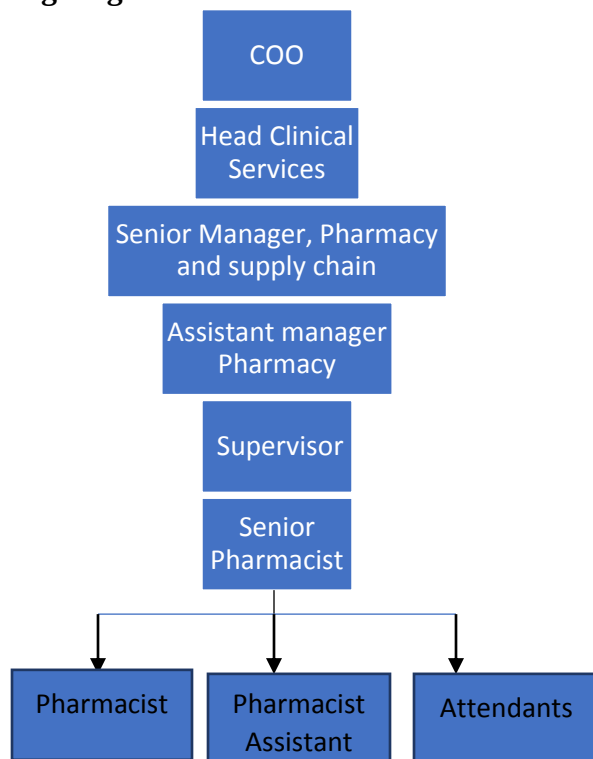
SUPPORT SERVICES

Pharmacy:

There are total 6 pharmacies- 2 OP Pharmacies, 1 IP Pharmacy, 1 OT pharmacy, 1 CTOT pharmacy, 1 Oncology Pharmacy. The OP pharmacy delivers to OPD patients and health check-up patients.

The IP pharmacy located in basement 1 of CIMS west. It has following functions:

1. Receiving and delivering indents
2. Taking patient returns
3. Verifying Patient discharge
4. Checking Patient medicines
5. Storage
6. Inventory management
7. Ward and department storage

Organogram:

At IP Pharmacy, there are well labelled almirahs, boxes and shelves by the name of drugs, type of items kept and categories like LASA, High risk, Narcotics etc. Pharmacy runs 24x7 with shift changing pharmacist. Attendants are available during day times. Narcotics and High-risk medicines are well taken care of by keeping them in safe boxes and supplying with doctor's prescription only. High risk Medicines are labeled with red tags on their tops.

Central Sterile Supply Department -

This department deals with sterilization of instruments used in surgical procedures. The department has unidirectional flow and maintains proper isolation. It has Autoclave machine, ETO sterilizer, Plasma machine.

Proper indicators are used to determine success of each procedure. There are well defined indicators for Steam sterilization, ETO and Plasma Sterilization.

There is a separate dispatch area and a separate unsterile instruments area.

Organogram:



House Keeping:

It provides cleaners. ISS source it. They clean the entire hospital and maintain hygiene.

Attendant Services:

It is provided by Raj Enterprises. They help in delivery of medicines, files, helping patients to walk, helping to guide patients/ visitors through hospital, patient transfer, food supply.

Kitchen and Dietetics:

It serves food and beverages at hospital canteen and in-patients. The food for patients is well managed by dieticians according to their requirements. The food given has separate markings as per its content.

Red tag for salt restricted diet

White tag for anti- diabetic diet

Green tag for normal diet

Blue tag for Soft diet.

The method to organize and indent the diet for patient is on paper till date but it is being made online soon to avoid human errors.

The kitchen staff is outsourced from Mohani Caterers. The staff working in the kitchen is medically checked and immunized by infection control department at CIMS.

Proper precautions are taken care of as- head cap, hand-wash and wearing gloves during Service.

Food is properly packed and labeled with type of diet, patient number, location.

There is a team of dieticians that works out proper diet for each patient. They work in two shifts.

Department of Infection Control:

It takes care of the infections and diseases that can occur to staff. Vaccinations and protocols to be followed for patient safety and staff safety are decided by them. Protocols for intensive care and neonatal care are decided by infection control.

This department undertakes bio-medical waste management and spill management.

Security Services:

Proper security and checking is essential for hospital. It is outsourced from Pioneer and Cosmos group. Security personnel are provided with walky-talky. They are supposed to check visitors and allow only those with an Patient pass or ID into the Building except OPDs.

ADMINISTRATIVE SERVICES:

Admission and Billing:

It is located at the ground floor. When the patient is admitted to hospital by planning or in case of emergency. Admission process is followed within 2 hours in case of emergency. A consent form is filled up its available in 3 languages- Hindi, English, Gujarati.

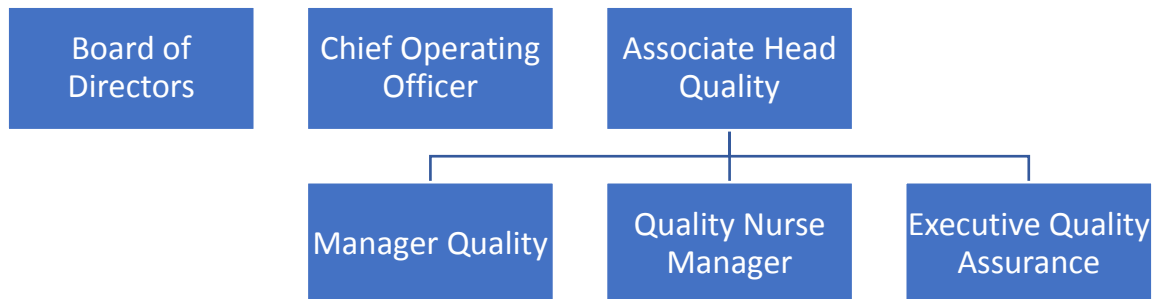
Process Flow:



Quality Assurance:

Purpose: the hospital follows a structured Quality improvement and patient safety program developed by Quality improvement and patient safety committee.

Organogram:



Functions:

IPSG Audits

NABH, NABL, JCI, Green OT Accreditation

Indicator monitoring

Indicators Validation

Department complaints, Error reporting

Quality control trainings

Internal assessment

Mock drills

SOP and policy development

Quality Improvement projects

Quality Improvement program monitoring

Medication error and incident monitoring

Statutory compliance

Hospital committee monitoring

Patient safety and quality improvement program

Clinical Care and MRD:

It handles Doctors and nursing staff, their duty timings, distribution, working, documentation, documentation related to patients. It also handles the complaints and problems related to them.

MRD keeps the patient records up to date and saves them in a computer database also. MRD saves inpatient files at basement.

“Six Sigma Approach to Reduce Medicine Delivery Time of In-Patient Pharmacy”

A Project on Drug delivery system of In-Patient Pharmacy

A Project on Drug delivery system of In-Patient Pharmacy

Title: Six sigma approach to reduce medicine delivery time of IP pharmacy.

Objectives:

- To identify the causes of delay in dispatching of medicine indents from pharmacy to respective departments.
- To Analyze the process, reasons of delay and provide suggestions.

Introduction

The delays in delivery of drugs has been a matter of concern for the hospital, nursing staff as well as for the pharmacists at IP Pharmacy as they are not able to deliver indents within the standard time set by the hospital policy of 30 minutes. This delay leads to delayed procedures on patients, delayed medications, increase workload on pharmacy.

The IP Pharmacy delivers drugs by 3 ways-Attendants of pharmacy, pneumatic system and attendants of floor that come to IP Pharmacy to take medicines.

In this study, the pneumatic system and delivery by pharmacy attendant is considered.

The indents by nursing staff are done by using online intra-hospital software PCS.

This study deals to map the complete process of making a drug packet to delivery till it is received by staff.

With this study, I aim to find the root cause of delays in the process at pharmacy and analyze the flaws in current process, provide effective suggestions, develop a new process.

DMAIC approach is used.

Literature Review:

Medication management involves patient centered care to optimize safe, effective, and appropriate drug therapy. Care is provided through collaboration with patients and their healthcare teams.

Inpatient Medication management: Medication distribution has long been primary function of hospital pharmacy services. Four basic type of medication distribution system exist:

1. Bulk ward stock replenishment
2. Individual medication order system
3. Unit dose system
4. Automated medication dispensing

Variations of each exist, depending on the strategy developed.

The inpatient setting of health system pharmacy is unique in several ways. The patients treated by a health system pharmacist typically have more complicated conditions than those in an ambulatory setting and take multiple medications.

A staff pharmacist may have exposure to oncology, intravenous (IV) medication therapy, neonatal care, nutrition, pain therapy, geriatrics, and much more. Staff pharmacists face a varied set of responsibilities including dispensing medication, making purchasing decisions, monitoring drug therapy, preparing IV medication, and overseeing drug administration.

The location and layout of the pharmacy can vary greatly among health systems. Some are centralized, with all the pharmacy staff and equipment located in a single area of the hospital, usually on one of the lower floors.

Another format is the decentralized pharmacy, where there is a main pharmacy in a central location but there are also “mini-pharmacies,” called satellites, located throughout the health system at key patient care units. The type of the pharmacy depends on the size, needs, resources, and focus of the health system.

Health system pharmacists interact with nurses and physicians in their positions. Often, they do not work directly with the patient, but rather with the other health care providers to optimize the patient’s therapy.

Medication turnaround time has also been defined as the time it takes for the pharmacy to process a medication order.

Evidence suggests that decreasing medication turnaround time can improve patient care, particularly for medications that have a critical impact on patient outcomes. For example, timely administration of antibiotics prescribed for community-acquired pneumonia, sepsis, and meningitis has decreased mortality rates and length of stay.

Reducing medication turnaround time can improve efficiency, patient safety, and quality of care in the hospital setting.

Regular evaluation of medication turnaround times is recommended to compare with benchmarks, to ensure that hospital standards are being met, and to measure the effects of policy changes and implementation of new technology on medication-use processes.

Problem Statement:

The delivery time of IP pharmacy higher than standard time limit.

Aim: Study aims to reduce the delivery time and deliver within standard time policy of 30 minutes.

Research Methodology

Type of Study:

Descriptive Study

Study Design:

Pre-test and Post-test

Variables:

Indent time: The time at which indent was made by nursing staff at nursing station using PCS.

Issue time: The time at which indent was issued at pharmacy after checking for mistakes.

Pneumatics:

Time In- when the medicines were put in chamber and sent into aerocom at Pharmacy.

Time Out- when the chamber was out at the receiving station.

Attendant

Time out- the time at which attendant moves out with bags to deliver from Pharmacy.

Time In- the time at which attendant comes back to pharmacy after delivering.

Received time:

The time at which staff received the drugs.

In case of pneumatic, the chamber out time is 1.5 minutes but staff receives it as per their convenience.

Drugs And Materials Indented:

The items that were indented by nursing staff.

Drugs Scheduled:

The time at which the drug indented is scheduled to be given to patient.

IP Number:

A specific number given to a patient at hospital which remains constant throughout treatments.

Study Population

IPD Patients at General Ward West, General Ward East, Intensive Care Unit East, Critical Care Unit, Premier CCU, Surgical ICU, DIALYSIS UNIT, Single Room East, Suite Room East, Premier ICU, Neonatal ICU.

Study area- IP And Respective wards

Sampling Method:

Purposive Sampling:

Only IP Patients are taken and the indents are taken in day time. The night indents are not monitored.

Sample size:

275 samples of Attendant delivered medicines

275 samples of Pneumatic delivered medicines

Total 550 Samples

Mode of Data Collection-

Observation Methods

Attendant-

The indent and issue time were taken directly from indent paper.

The Time out and Time In were recorded by clock.

The received time was noted from receipt.

Pneumatic-

The indent and issue time were taken directly from indent paper.

The Time In and Time out were recorded by clock.

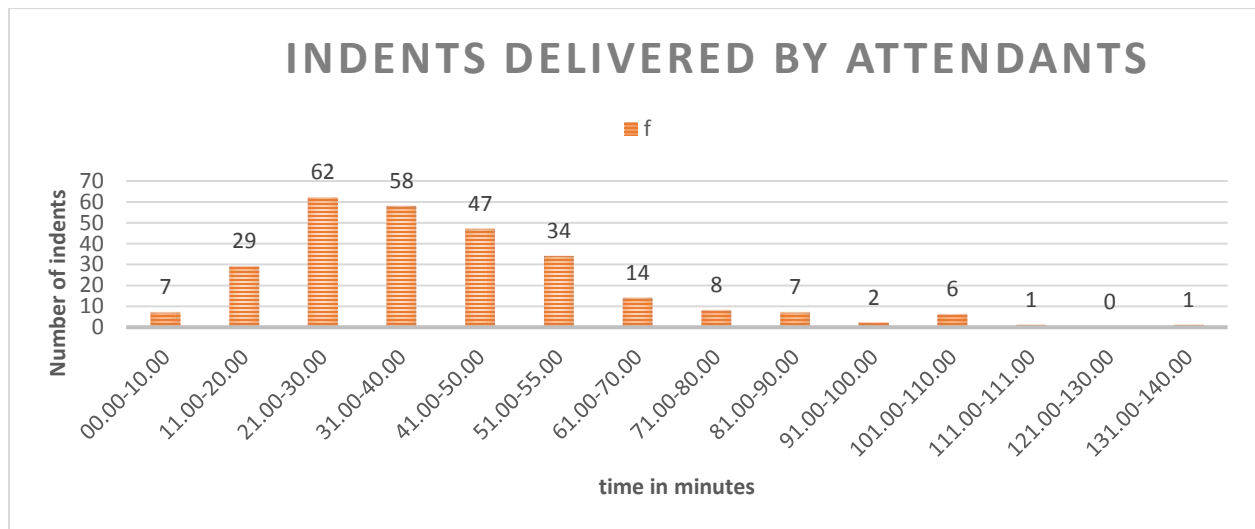
The received time was noted from receipt as well as by direct observation.

Type of Data:

Quantitative

Data Analysis:

	PNEUMATIC INDENTS	ATTENDANT DELIVERED INDENTS	TOTAL
WITHIN 30 MINUTES	137	98	235
ABOVE 30 MINUTES	138	177	315
TOTAL	275	275	550



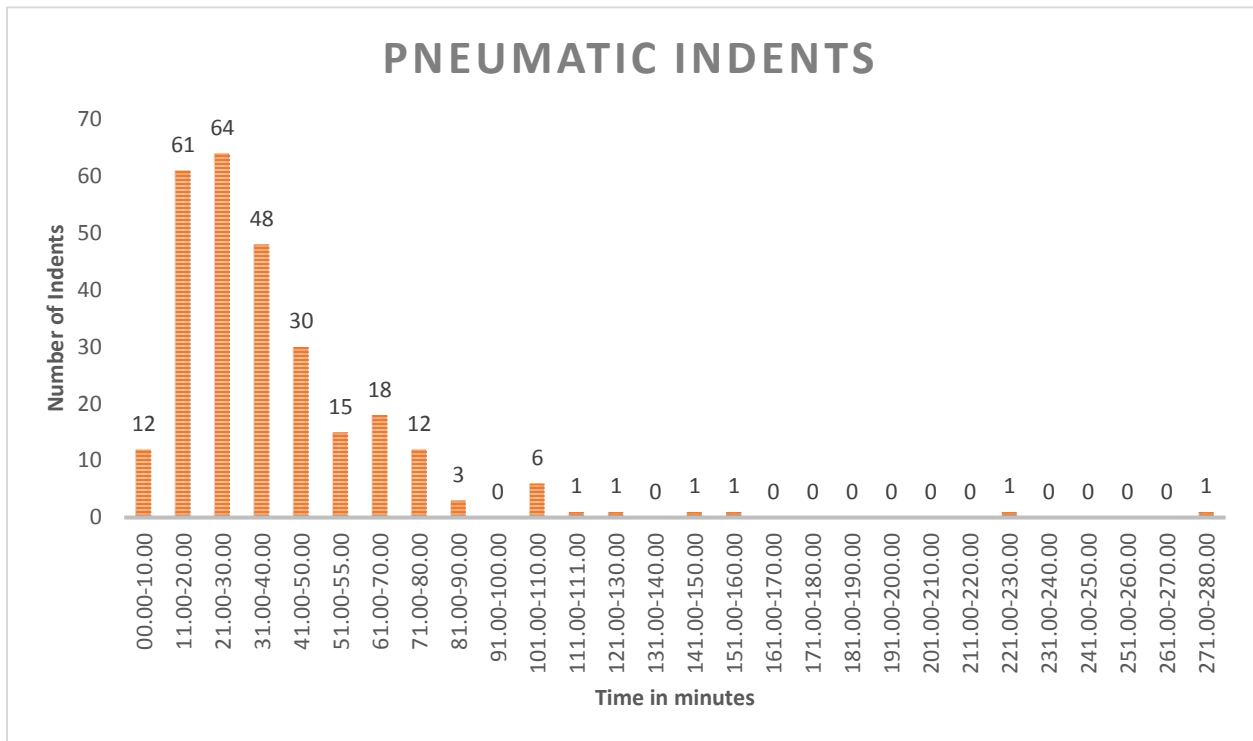
X Axis - Time intervals in minutes

Y Axis - Number of indents

Frequency

The Graph illustrates distribution of 275 indents every next 10 minutes.

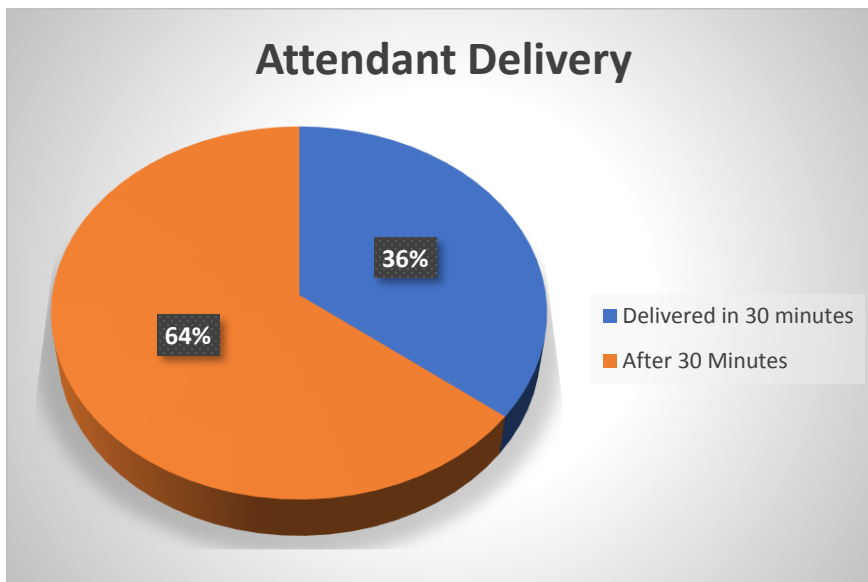
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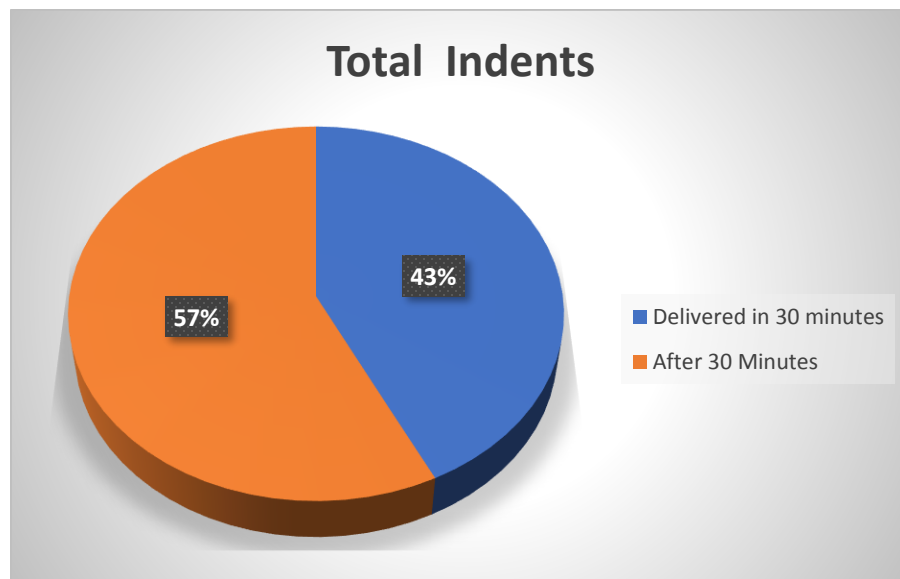
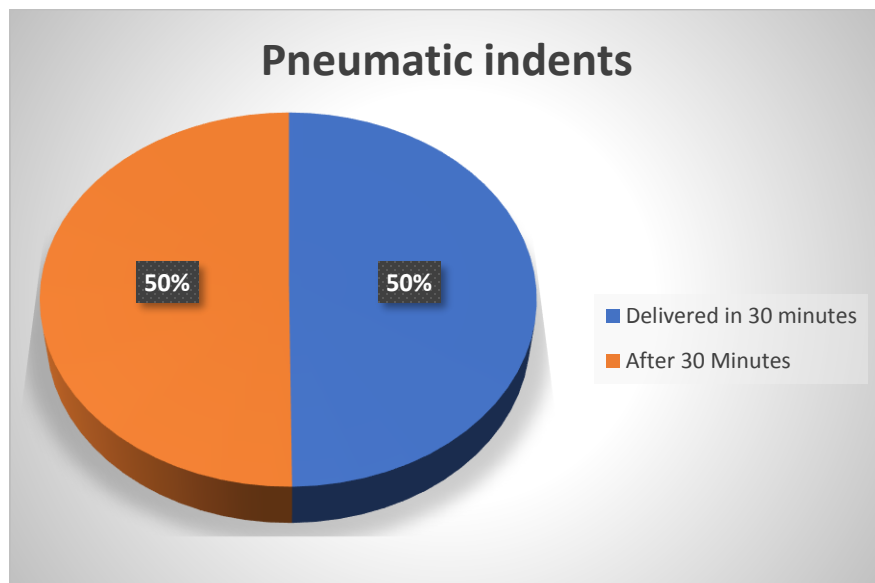


X axis- time intervals in minutes

Y Axis – Number of indents (Frequency)

Pie Chart:





Z test

Z test is applied to test the study,

Null hypothesis: The indents are delivered within standard time of 30 minutes.

Alternate hypothesis: The indents are not delivered within 30 minutes.

Z test for Attendant delivered indents.
Total samples- 275

Intervals(Mins)	x	f	fx	X-x	(X-x) ^o	f.(X-x) ^o
00.00-10.00	5	7	35	-36.25	1314.3	9199.8
11.00-20.00	15.5	29	449.5	-25.75	663.2	19232.9
21.00-30.00	25.5	62	1581	-15.75	248.1	15385.2
31.00-40.00	35.5	58	2059	-5.75	33.1	1919.4
41.00-50.00	45.5	47	2138.5	4.25	18.0	847.8
51.00-55.00	55.5	34	1887	14.25	203.0	6901.5
61.00-70.00	65.5	14	917	24.25	587.9	8231.0
71.00-80.00	75.5	8	604	34.25	1172.9	9383.0
81.00-90.00	85.5	7	598.5	44.25	1957.8	13704.7
91.00-100.00	95.5	2	191	54.25	2942.8	5885.5
101.00-110.00	105.5	6	633	64.25	4127.7	24766.3
111.00-111.00	115.5	1	115.5	74.25	5512.7	5512.7
121.00-130.00	125.5	0	0	84.25	7097.6	0.0
131.00-140.00	135.5	1	135.5	94.25	8882.5	8882.5
		275				
Attendant		$\sum fx$	11344.5		$\sum =$	129852.5
		X=	41.25		variance	472.19
					sd	21.73
Z Test						
Z= X- $\mu/s.d/\sqrt{n}$						
X- μ		11.25				
sd/ $\sqrt{n}$		1.310365405				
Z		8.6				

Z Calculated = 8.6

Z Tabulated = 3.8

Z Calculated > Z Tabulated

Hence, Null Hypothesis Rejected, that indents are delivered within 30 minutes.

Z test For Pneumatic Indents-

Total samples- 275

Intervals(Min s)	f	x in mins	fx	x-X	(x-X) ²	f.(x-X) ²
00.00-10.00	12	5	60	- 33.39	1114.709 98	13376.519 76
11.00-20.00	61	15.5	945.5	15.50	240.25	14655.25
21.00-30.00	64	25.5	1632	25.50	650.25	41616
31.00-40.00	48	35.5	1704	35.50	1260.25	60492
41.00-50.00	30	45.5	1365	45.50	2070.25	62107.5
51.00-55.00	15	55.5	832.5	55.50	3080.25	46203.75
61.00-70.00	18	65.5	1179	65.50	4290.25	77224.5
71.00-80.00	12	75.5	906	75.50	5700.25	68403
81.00-90.00	3	85.5	256.5	85.50	7310.25	21930.75
91.00-100.00	0	95.5	0	95.50	9120.25	0
101.00- 110.00	6	105.5	633	105.5 0	11130.25	66781.5
111.00- 111.00	1	115.5	115.5	115.5 0	13340.25	13340.25
121.00- 130.00	1	125.5	125.5	125.5 0	15750.25	15750.25
131.00- 140.00	0	135.5	0	135.5 0	18360.25	0
141.00- 150.00	1	145.5	145.5	145.5 0	21170.25	21170.25
151.00- 160.00	1	155.5	155.5	155.5 0	24180.25	24180.25
161.00- 170.00	0	165.5	0	165.5 0	27390.25	0
171.00- 180.00	0	175.5	0	175.5 0	30800.25	0
181.00- 190.00	0	185.5	0	185.5 0	34410.25	0
191.00- 200.00	0	195.5	0	195.5 0	38220.25	0
201.00- 210.00	0	205.5	0	205.5 0	42230.25	0
211.00- 220.00	0	215.5	0	215.5 0	46440.25	0
221.00- 230.00	1	225.5	225.5	225.5 0	50850.25	50850.25
231.00- 240.00	0	235.5	0	235.5 0	55460.25	0
241.00-	0	245.5	0	245.5	60270.25	0

250.00				0		
251.00- 260.00	0	255.5	0	255.5 0	65280.25	0
261.00- 270.00	0	265.5	0	265.5 0	70490.25	0
271.00- 280.00	1	275.5	275.5	275.5 0	75900.25	75900.25
	27 5	$\sum fx$	10556. 5		$\sum f.(x-X)^2$	673982.26 98
		X=	38.39		variance	2450.84
					S.D	49.51

Z test	
X- μ	8.39
S.d/ $\sqrt{n}$	2.99
Z=	2.81
Z tab=	1.97

Z Calculated= 2.81

Z Tabulated= 1.97

Z Calculated > Z Tabulated

Therefore, Null hypothesis rejected.

Defects per Opportunity

Defects per opportunity is the number of defects in a sample / total number of defect opportunities

$$= 315 / 550 \times 11$$

$$= 0.052$$

Defects per million opportunities

= (Total number of defects found in a sample / Total samples * number of defect opportunities per unit in sample) * 1000,000

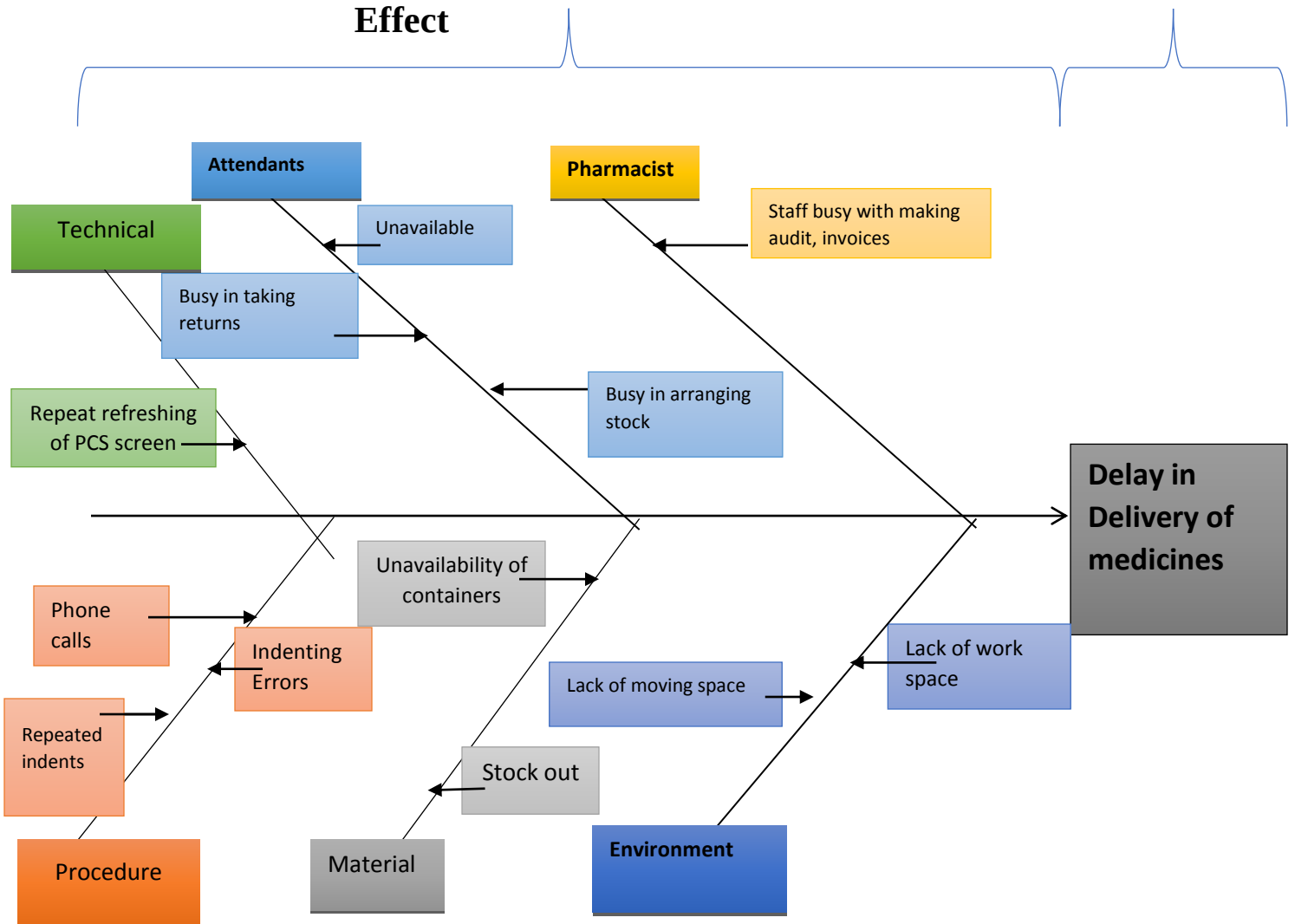
$$= (315 / 550 \times 11) \times 1000,000$$

$$= 52066$$

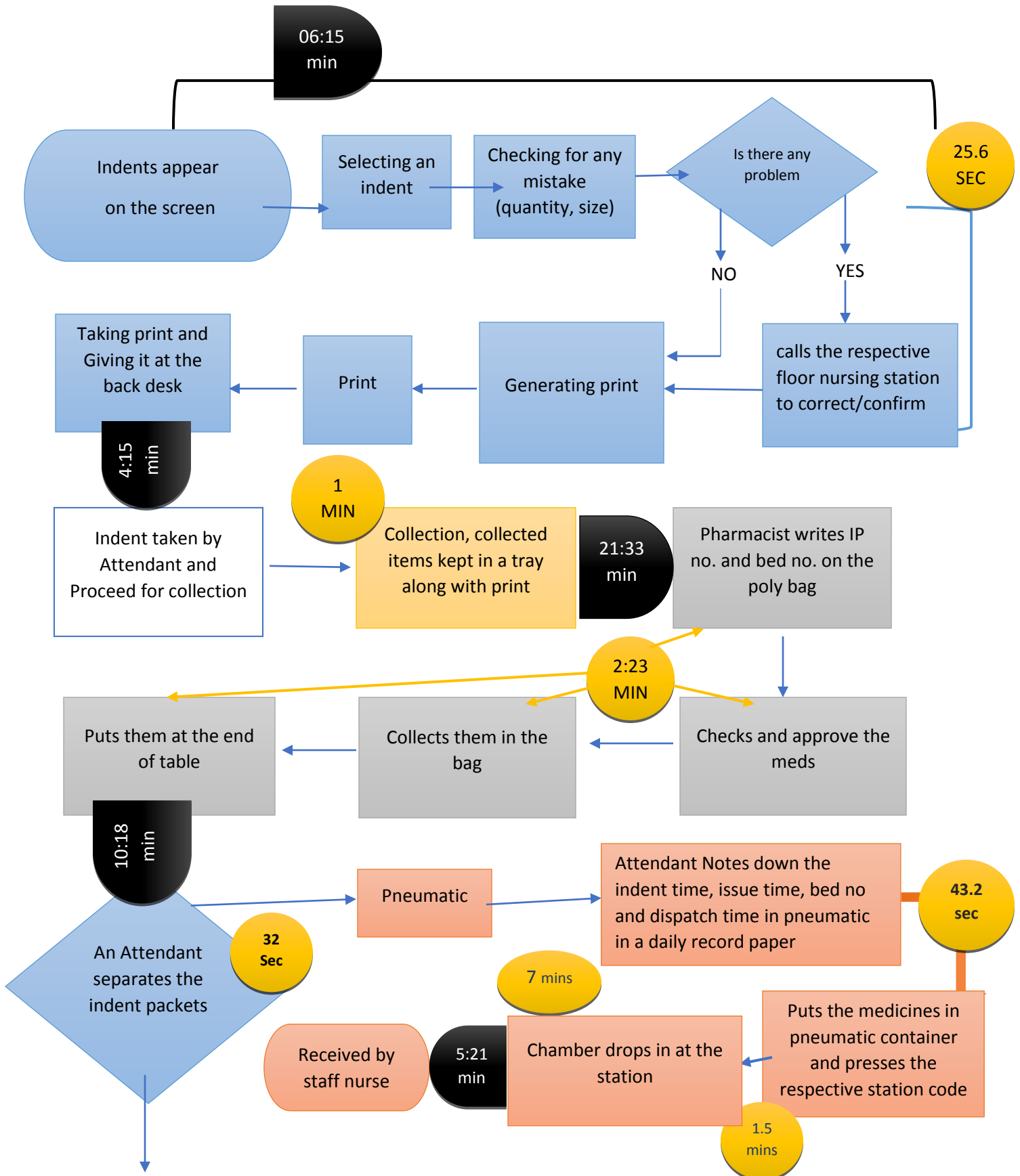
Root Causes: Fish Bone Diagram

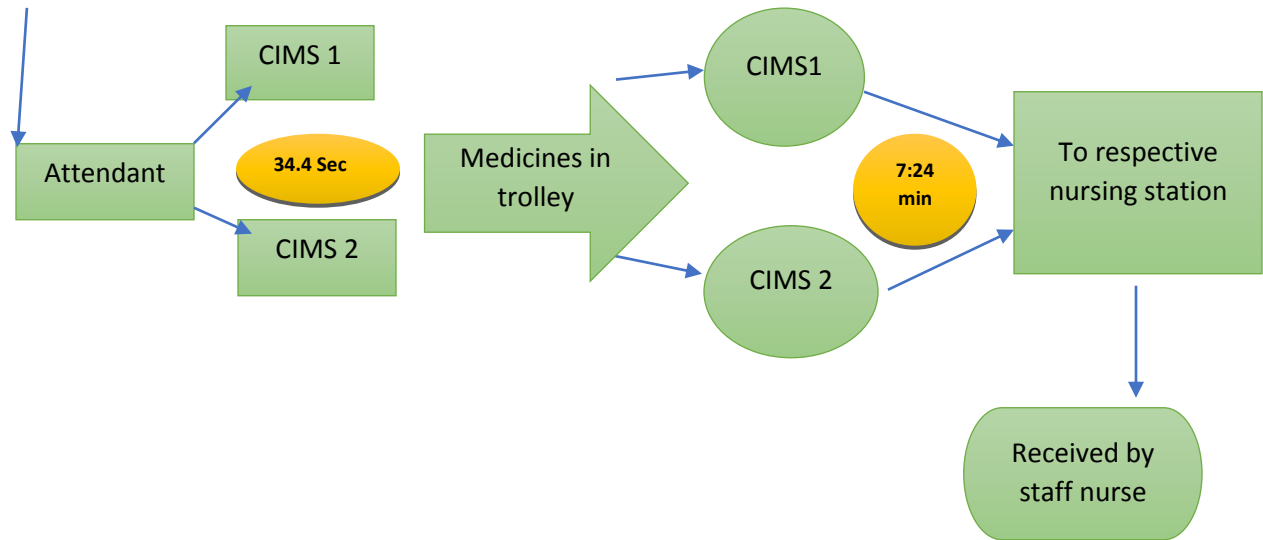
Cause

Effect



PROCESS MAP:





Problems:

1. The indent receiving procedure is long and repetitive.
2. There are continuous indents by Out-patient pharmacy, OT pharmacy.
3. Continuous returns by wards although the return time is fixed at mid night, this creates an increase workload at pharmacy.
4. Nursing staff creates returns even during floor transfers and creates a new indent on the next floor of same medicines.
5. Lack of moving space.
6. Service Window is half opened and is made of wood. It is opened half to maintain the temperature within pharmacy. Utilization of half window creates a crowd of attendants in the corridor and increases their waiting time.
7. There are a lot of phone calls.
8. The nursing staff creates indents on repeat and phone at IP to have their medicines delivered soon.
9. The pharmacist at a time taking indents and returns and checking stock and making purchase, which is hectic.
10. Attendants are less in number, if all of them have gone to deliver, medicines have to wait.
11. Nursing staff is untrained to make correct indents hence calls are made to correct.
12. OP pharmacy does not maintain its inventory and every 10 minutes there is an indent for its store.
13. There is lack of storage, all the new stock is stacked at IP, hence that is also done by attendants and reduces space for moving.
14. The receipt is often not sent by floor to IP.

Result:

1. Of 275 Pneumatic samples 138 were delivered in more than 30 minutes.
2. Of 275 Attendant delivered samples 177 were delivered in more than 30 minutes.
3. Of total 550 samples 315 samples took more than 30 minutes to delivery.
4. The average time taken by pharmacy to deliver medicines via attendants is 41 minutes and 25 seconds.
5. The Average time taken by pharmacy to deliver medicines via pneumatic is 38 minutes and 39 seconds.
6. Majority of indents are delivered in 21 to 30 minutes in case of attendant delivery as well as pneumatic delivery.
7. The average delay between indent and issue time is 06 minutes and 15 seconds.
8. The average delay at giving the print to attendant is 4 minutes 15 seconds.
9. The Average delay between collection and Packaging is 21 minutes 33 seconds.
10. The average time packaged medicines wait for delivery 10 minutes 18 seconds.
11. In pneumatic the average time taken to acknowledge the received chamber is 5 minutes 21 seconds.
12. Of 1000,000 opportunities 52066 packages will be delayed.
13. Of 550 samples in total defect per unit is 0.57, indicating the quality level and each unit of product on average contains this number of defect.
14. Of 429 opportunities of defect, defect per opportunity is 0.074.

Recommendations:

1. Training of nursing staff to make correct indents/returns, how to use formulary and preparing patients drugs before procedures and doctor's visit.
2. IT: Software should be modified to prevent system hangs; new indents should pop themselves rather than repeated refreshing.
3. Printed indents should not be stacked on printer. They should be passed to attendants as soon as printed.
4. Pharmacist should not wait too long to approve and pack the medicine and all medicine should be packed as soon as they are ready.
5. The medicine packs that are to be sent by pneumatic should be kept on the right end and those to be delivered by attendants on left end. This will help as, pharmacist knows the contents of bag so he can separate them right at the moment he finishes packing. Then, pneumatic packets putting on right end will help as these packets will be close to pneumatic system and the others which are to be delivered by attendants will be kept on left as it is closer to door and will save time as attendant won't have to cross over pharmacist to take the bags.
6. Floor nursing stations to be guided for receiving the pneumatic chamber as soon as possible and returning it. Don't send them to carry patient's blood samples. this will rule out the cause of unavailability of chambers at pharmacy to deliver drugs.
7. Do not make regular/normal indents at night; for emergency indents, send floor attendant to take medicines.
8. All personnel should learn pneumatic system and its indications.
9. Pharmacist making purchase should be separate from those taking indents.
10. Separate room for cartons/stock/expired drugs.
11. Open service window completely and divide the section between- return and take away section. Putting a glass
12. Do not allow OT/ floor attendants to take drugs themselves.
13. There can be central pharmacy to deliver to stores and wards stock and IP to deliver Patient medicines.

Implementation Phase:

The recommendations were explained to Pharmacy, Quality, and Nursing Staff in several meetings. They were taught how to make indents, preferably making 24-hour indent.

5th and 6th floor were chosen as the floors to apply the changes first.

There were in total 7 meetings with pharmacists, senior nurse of 5th floor and then with 6th floor.

Pharmacists were taught how to separate the two bags and not letting medicines wait for the approval and delivery.

About window opening, suggestion of glass window was accepted and is under consideration of design of glass.

Training Phase:

Nurses were taught to make correct indents and how to indent items that are associated with the medicines and procedures though not shown in treatment.

Pharmacists were trained to separate bags, not to stack papers and separate their duties.

Nursing staff was trained to make 24- hour indent.

Monitoring:

The day indents are monitored regularly for 5th and 6th floor and at pharmacy for new process. The repeated indents were noted and reported back.

Pilot Study:

Sample Size: 100

Floors Included: 5th and 6th

Delivery type: Pneumatic and Attendant

Time: Morning and Afternoon Indents

Statistics:

SAMPLES DELIVERED	NUMBER
PNEUMATIC	48
ATTENDANT	52
	100

ABOVE 30 MINUTES	28
WITHIN 30 MINUTES	72

Defects per Opportunity

Defects per opportunity is the number of defects in a sample / total number of defect opportunities

$$= 28 / 100 * 11$$

$$= 0.025$$

Defects per million opportunities

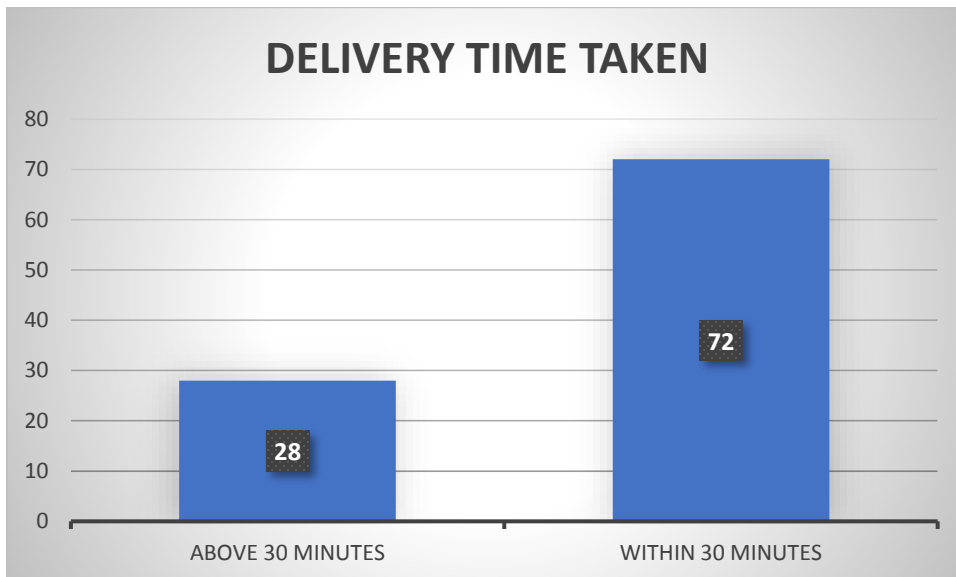
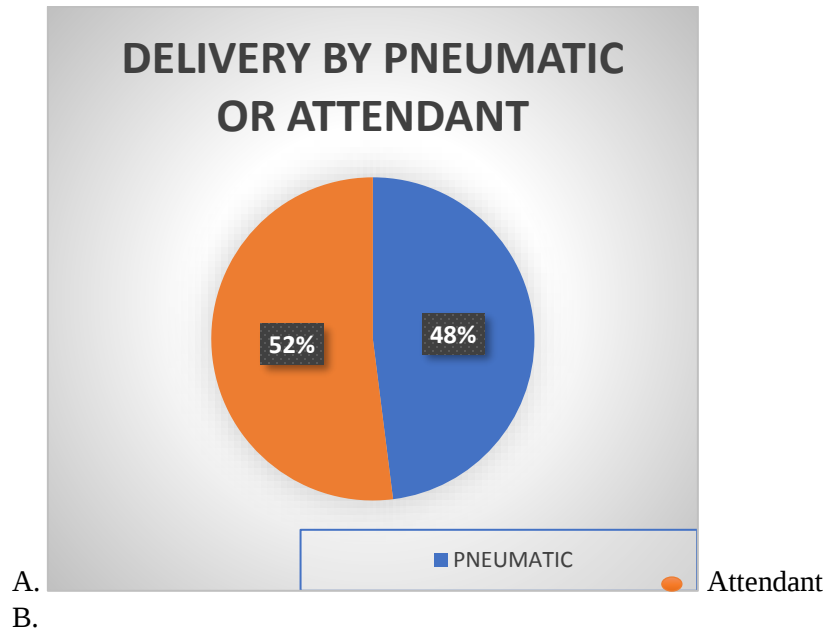
= (Total number of defects found in a sample / Total samples * number of defect opportunities per unit in sample) * 1,000,000

$$= (28 / 100 * 11) * 1,000,000$$

$$= 25454$$

Sigma Value: 3.45

PIE CHART:



Data Analysis:

1. Out of 100 samples 28 were delayed.
2. Average time of delivery is 28 minutes.
3. Of 11 opportunities of defect, 0.032 defects per opportunity
4. 25454 samples will be delayed, when 1000,000 samples will be tested.
5. Of 100, 52 samples delivered by Attendants.

Improvement:

	Pre- test	Post Test
Average Time taken	39.5 minutes	28.25 minutes

Control:

Continuous monitoring and training to new staff at Pharmacy and Nursing Stations.

A working pneumatic system in CIMS WEST building as well.

Continuous reporting of unwanted events.

Conclusion:

The Project aims to reduce the Medicine delivery time of Inpatient Pharmacy by applying a six-sigma approach. Process was mapped and time for each step was noted. Delays and reasons for each delay were explored and noted. A distinct delay and double process was noted which led to delays in medicine delivery. A new process was implemented with training and meetings. With implementation of new process, continuous monitoring was done and unwanted events were reported. A pilot study was conducted on 5th and 6th floor as a check on the implementation of new process and effects were noted.

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