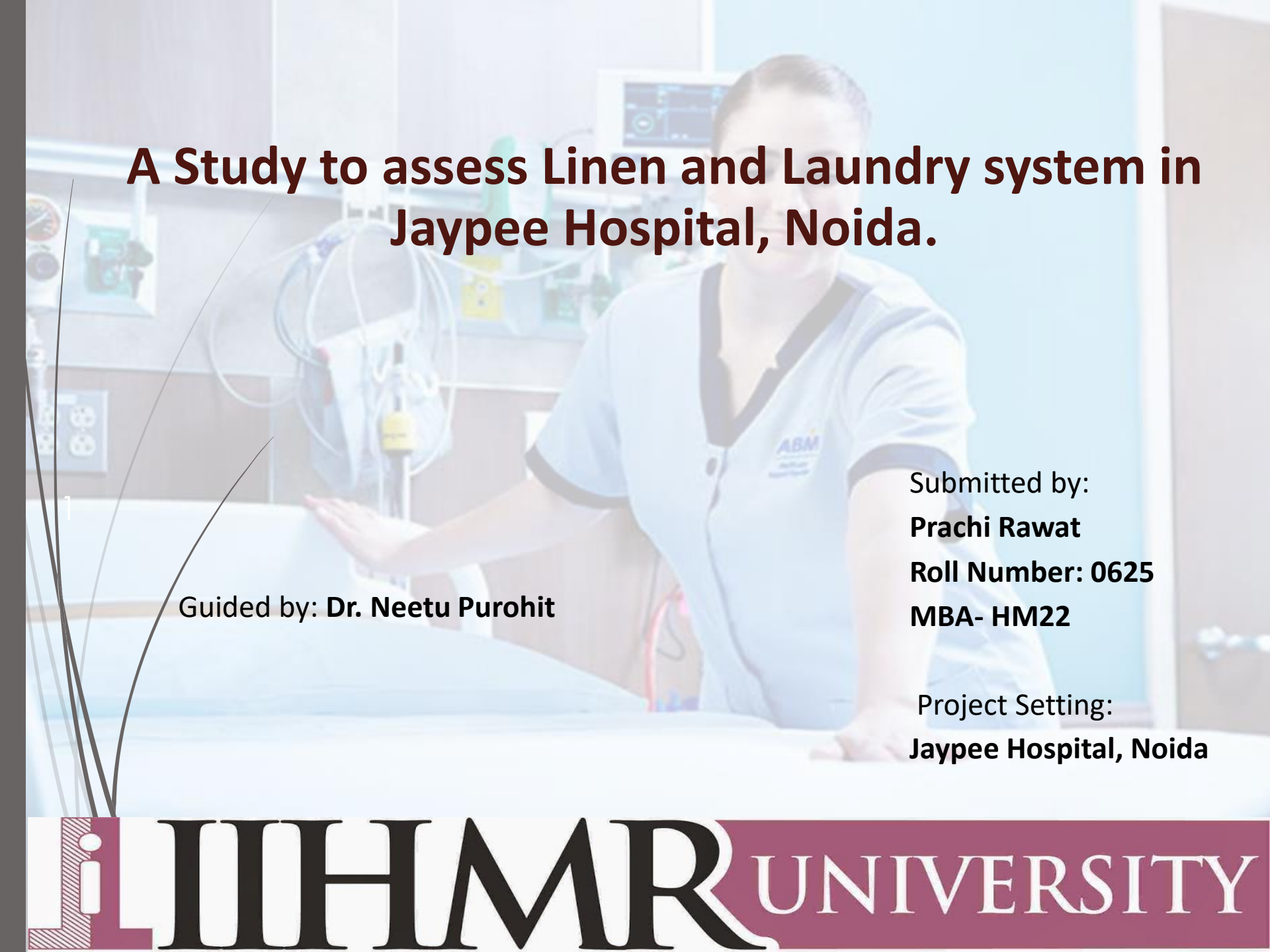


A healthcare worker in a light blue uniform with an 'ABM' logo is standing in a hospital room, gesturing towards medical equipment. The background shows a patient bed, IV stands with bags, and a monitor.

A Study to assess Linen and Laundry system in Jaypee Hospital, Noida.

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MBA- HM22

Project Setting:

Jaypee Hospital, Noida



Introduction to the Project

1

Introduction

Review of Literature

Rationale

Introduction

- ▶ In the healthcare industry, priority is always set on the patients. Every healthcare organisation has the goal of making sure their patients are comfortable and ultimately, that they are healthy.
- ▶ Laundry service is responsible for providing and adequate, clean and constant supply of linen to all users. It is a backstage service that is critical for a hospital's functioning.
- ▶ Jaypee hospital is a 338 bedded multispeciality hospital, situated in Noida, with the presence of In- House Laundry services situated in the lower basement area of the hospital.

Review of Literature

- ▶ James S, Skinner G. in their study “Management by Numbers” stated that Cost finding and cost analysis are the technique of allocating direct and indirect costs. They are also the process of manipulating or rearranging the data or information in existing accounts in order to obtain the costs of services rendered by the hospital. If structured accurately, cost data can provide information on operational performance by cost center. Moreover, knowledge of costs (both unit and total) can assists in planning for future budgets (as an indicator of efficiency) and to establish a schedule of charges for patient services.
- ▶ Ricci, Joseph in his study “Best Practices for Reducing Linen Loss, Hotel Business Review”, April 2014; theft or deliberate or inadvertent abuse of textile products are the major causes of their premature removal from service, raising costs. There are two types of losses- Actual loss refers to intended or unintended theft, abuse and discarding whereas, Artificial loss refers to inaccessible but retrievable inventory; goods are overstocked at the point they are about to be put into service. This wastes storage space and increases vulnerability to theft.
- ▶ In the article, “Optimizing Economic Order Quantity,” published by Dave Piasecki in 2001, focused on the economic order quantity. Piasecki mentions that in today’s leading technology, many companies are not taking advantage of the fundamental inventory models.

Review of Literature

- There are various software packages in aiding companies with inventory control, but if the data inputted are inaccurate, it may lead to poor results. In order to have suitable results for any inventory model, accurate product costs, activity costs, forecasts, history, and lead times need to be in place. As a result of bad data, companies have had bad experience with some inventory models, and that is one of the reasons they do not take advantage of the EOQ model.
- Standard Textile Co. Inc., 2008; states that facilities without discard programs are needlessly rewashing 3-5% of their total linen poundage. For example, a nurse takes a clean flat sheet off of the linen cart and finds out it has a ripped corner. If that sheet, which was never used with a patient, is then thrown into the soiled hamper, it will most likely get washed and delivered back to another unit, continuing the cycle. A discard program allows the end user to have the ability to remove that item from circulation and alert the laundry to evaluate the status of the item. The laundry can then decide if repairs should be made, the linen can be used for ambulance squads, or if it should be sold to the rag vendor. Facilities with outside laundries can feel the most significant impact of this program. For each pound of linen that is not washed, 100% of the processing cost per pound is saved by that facility. For example, a hospital without a discard program, processing 2,000,000 pounds of linen each year, could potentially be spending \$19,200 to wash unusable linen.

- The study was carried out to assess the linen and laundry system in Jaypee Hospital, Noida.
- There was no assessment on the amount of pilferage. It was important to know whether the linen replacement cost is due to linen reaching the end of its useful life or due to the reason of pilferage.
- The quantity of **linen loss** in the hospital became important as there was no proper record of linen **utilization and condemnation**. The rate at which the linen is being discarded in the hospital is also important to assess.
- The **cost analysis** of the laundry process was conducted to assess the operational performance of the department and also to know the level of direct and indirect cost associated with it.
- An **Ideal order quantity (EOQ)** could assist in deciding what would be the best optimal order quantity at the company's lowest price. Therefore four mostly consumed linens were taken and Ideal quantity level were set.



Methodology

2

Objectives of the study
Study Methodology

Objectives of the Study

- To calculate the amount of linen loss and suggest preventive measures to avoid it.
- To calculate the amount of discarded linen in past two year.
- To forecast the condemnation of linen for the following year. (2019)
- To know the operational cost of laundry of bed linen.
- To determine the ideal quantity level (EOQ) for the top four mostly used linen items in the hospital.

Study Methodology:

Research Question:

What is the quantity of linen loss in the hospital?
What is the quantity of discarded linen in past two year?
What is the operational cost of laundry of bed linen?
What is the ideal quantity (EOQ) for the top four mostly used linen items in the hospital.?

Study Design – Descriptive Study

Project Setting- Jaypee Hospital, Noida

Duration of the study- 2 months

Data collection

3

3.1 Linen loss

For this study the secondary data was collected from the Jaypee hospital Database.

- Total purchase of linen was collected from the year 2014 to March 2019 from the purchase department. It was compiled and calculated to be total of Rs. **1.6 crores** approximately.
- After that condemnation data was taken. The hospital had the condemnation report of 2017 and 2018 only. Due to which the only way left to carry forward this study was to take the average of per year and apply it to the previous three years. i.e for the year 2014, 2015 and 2016.
- Current stock of the linen in the laundry department as per March 2019 was calculated and compiled and it turned out to be 5785 in quantity and has the value of Rs. **12 lakhs** approximately.
- After this, the amount of linen that were in circulation was calculated (i.e the amount of linen that was being used by the hospital at that time) and it turned out to be 3026 in quantity and has the value of Rs. **29 lakhs** approximately. This data was provided by the laundry department itself.

Data for estimating the rate of pilferage

	QTY	TOTAL VALUE
TOTAL PURCHASE FROM 2014-2019 MARCH	73136	16112361.31
CONDEMNATION FROM 2014-2019 MARCH	11440	2809565
CURRENT STOCK IN LAUNDARY AS PER MARCH	5785	1227702.7
LINEN IN CIRCULATION AS PER MARCH	3026	2911558.26

3.2 Discarded linen

- The data of 2 years 2017 and 2018 was collected as these were the only records available with Laundry Department. The data was compiled and total condemnation of every quarter was calculated.
- On the basis of this, condemnation rate of next year i.e 2019 was forecasted using 5 months Moving Average Forecasting Technique.

Months	ACTUAL	3 months MA	5 months MA
Mar-17	584		
Jun-17	271		
Sep-17	443	433	
Dec-17	531	415	
Mar-18	591	522	484
Jun-18	666	596	500
Sep-18	821	693	610
Dec-18	669	719	656
Mar-19	X	745	687
Jun-19	X	669	719
Sep-19	X	X	745
Dec-19	X	X	669

3.3 Cost Analysis

Inclusion criteria:

- Laundry cost for only bed linen which comprises of Bed sheet, Pillow covers, Pillow protectors, Hand towel, Bath towel and Blankets are included.
- Cost analysis is done on the basis of different types of room available in the hospital like Multi room comprising of either 4 or 5 beds, twin room, single and deluxe room .

Exclusion criteria:

- Cost of land and building are excluded from the study
- Minor cost like cost of linen carrying bags, gloves, mouth masks etc. are excluded.

- The process of laundry was observed in the laundry department of the Jaypee hospital and all the items and services used in carrying out one wash cycle were recorded in a checklist under the following headings.

LINEN

CHEMICALS

MISCELLANEOUS

- Linen included the cost of all the linens provided to the patient i.e bed sheet, pillow cover, pillow protector, hand towel, bath towel and blanket. Since the linen have the shelf life of 300 washes i.e approximately 10 months. The cost of the single use of linen was calculated from this data.
- The average number of wash cycle carried out by a single machine in laundry department per day is 10 wash cycles. Minimum of 8 cycles/day and maximum of 12 cycles/day
- Cost of chemicals was calculated using the unit price which was taken from the Purchase department of the hospital.

- Miscellaneous included the manpower cost, Machinery cost, AMC, electricity, water and gas supply cost which forms the major portion of the Total cost.
- Since the cost calculated was for 50 kgs of linen as the machine considered in the study wash upto 50 kgs of linen in one wash cycle. Therefore, to estimate the cost of only the bed linen requires the cost to be break downed into per kg cost (as seen in Table)
- After that the linens were weighed and the cost estimation was done accordingly.

3.4 Ideal quantity level

The Jaypee hospital HIS was used to collect the relevant operational data for past two years which could help in determining the Economic order quantity level for the mostly used linen items.

That are:

Bed sheets

Pillow covers

Patient uniform

Nursing uniform

FORMULA:

$$EOQ = \sqrt{\frac{2 SD}{H}}$$

RESULTS

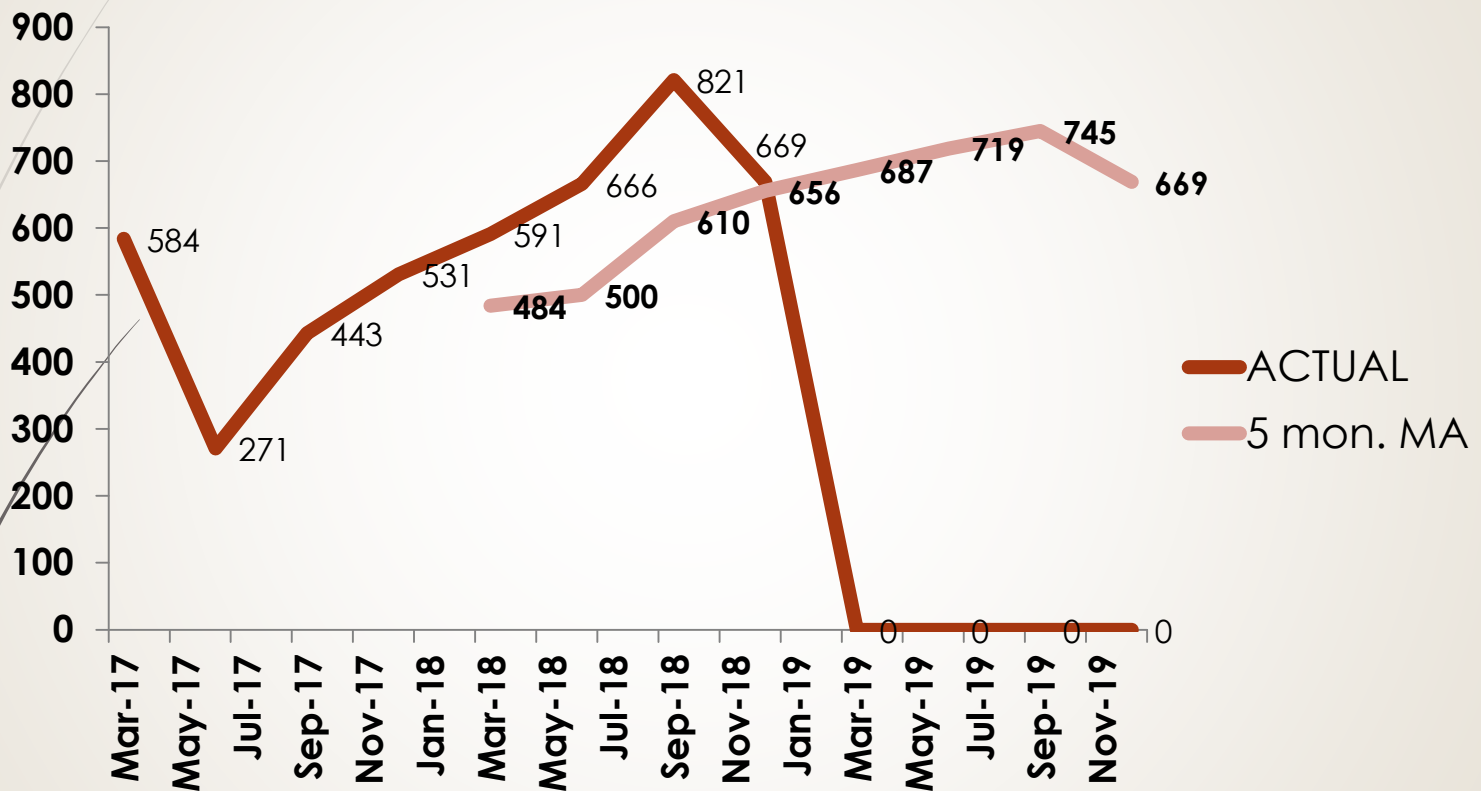
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4.1 Linen loss

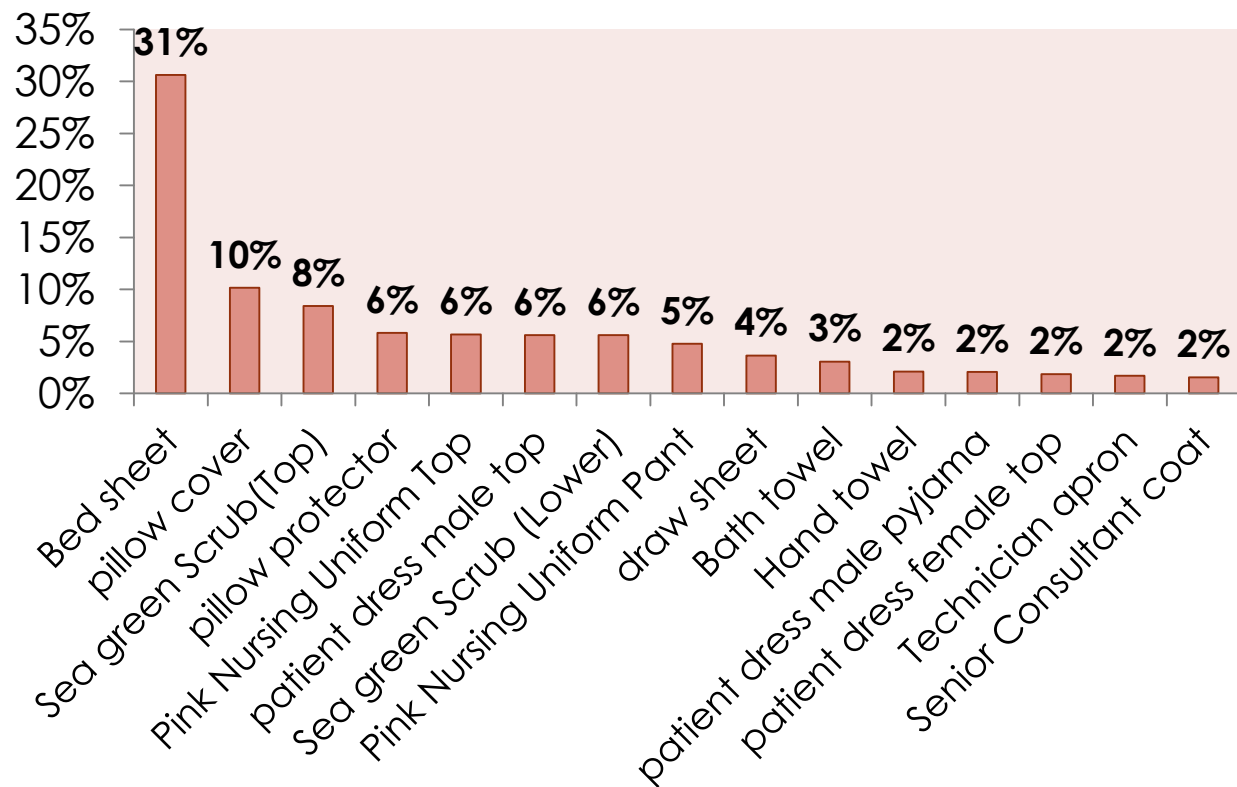
FROM 2014- 2019 MARCH	QTY	TOTAL VALUE FROM 2014-2019 MARCH	PER YEAR	PER MONTH	PER DAY
PILFERAGE/MISCELLANEOUS	52885	9163535.35	2290883.8	190906.9	6363.5

FORMULA = Total Purchase – (Condemnation of linen + Current Stock of Linen + Linen in Circulation)

4.2 Discarded linen



The graph shows the condemnation rate for the year 2019 using 5 month Moving Average Forecasting Technique.



The graph shows that the mostly consumed and condemned linen item is bedsheet i.e 31 % followed by pillow cover 10% followed by scrubs, pillow protector and so on.

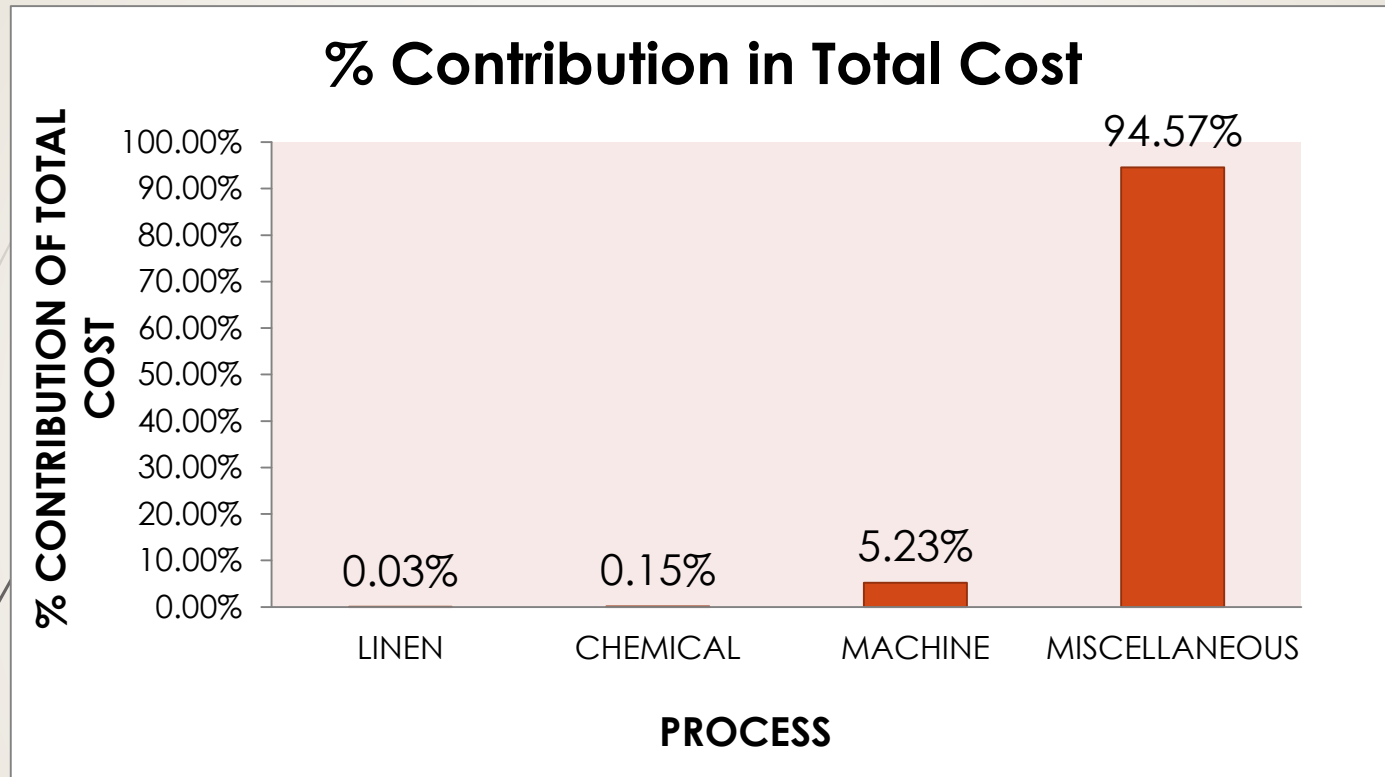
4.3 Cost Analysis

S.NO	DIRECT COST	MULTI ROOM			TWIN ROOM			SINGLE ROOM		
		Qty	weight (gms)	cost	Qty	weight (gms)	cost	Qty	weight (gms)	cost
1	Bed sheets	2	1000	4k	3	1500	6k	3	1500	10 k
2	Pillow covers	2	200		3	300		3	300	
3	Pillow protectors	2	400		3	600		3	600	
4	Blankets	1	1100		2	2200		2	2200	
5	Bath Towel	0	0		0	0		1	550	
6	Hand Towel	0	0		0	0		1	150	
TOTAL COST			2700	542.7		4600	924.6		5300	1065.3

- The above table suggests that the cost incurred was Rs. **542.7** for Multi-room; Rs. **924.6** for Twin room and Rs. **1065.3** for Single and Deluxe rooms.

The difference in the cost of different room is due to the the varying quantity of linen allotted to different rooms.

- Multi rooms have been allotted 2 sets of bed sheet, pillow covers and pillow protectors each, whereas no hand towel and bath towel is being provided.
- Twin rooms have been allotted three sets of bed sheet, pillow covers and pillow protectors each and no hand and bath towel is being provided.
- The only cost difference between Twin room and Single room is due to inclusion of One set of hand towel and bath towel each in single room.



The above graph shows the percentage contribution of every part of the laundry process. The graph depicts that the miscellaneous part comprising of indirect cost like (water and electricity cost, gas supply cost, AMC) contributes to about 94% of the total cost. While the machine contribute to around 5% of the total cost.

It is evident from the study that electricity cost, water cost, gas supply cost, manpower cost and machinery cost are major input to the laundry department

4.4 Ideal quantity level

BED SHEET

➤ **Actual demand (D) = 311 X 3 = 933**

➤ Now to determine the **Ordering cost (S)**, following costs were included:

- Manpower cost (purchase + store) –

There are total of 14 employees in both purchase and store department who are directly related with the work of generating Purchase requisition and then Purchase order and then GRN is made.

The average purchase order made every month is around **1281**.

And the combined salary of all the employee is 6.4 lacs per month.

On calculating the contribution of manpower in order cost is Rs. **500**

- Paper cost
- Electricity cost
- Printing cost

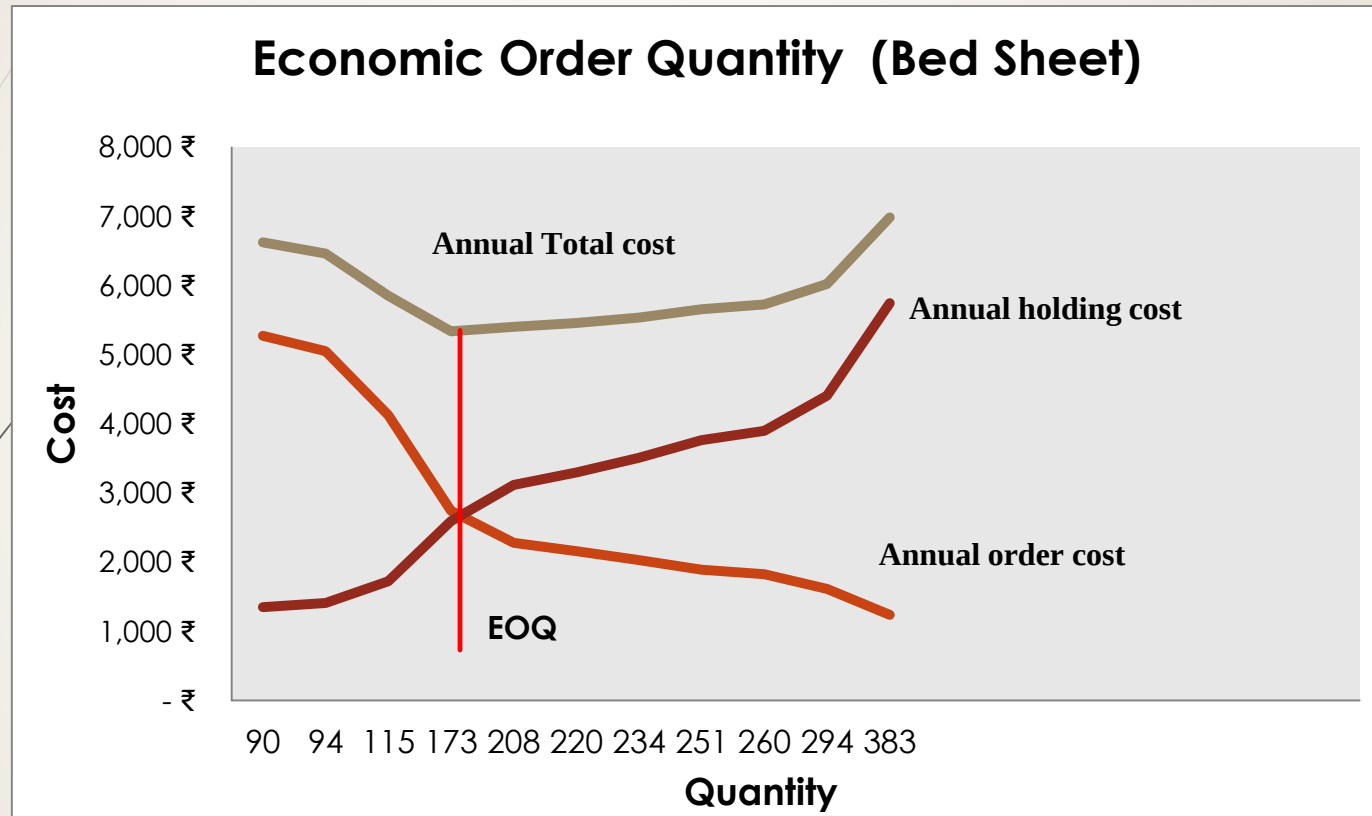
Combining paper cost electricity cost and printing cost for 10 pages on an average. It turned out to be Rs. **22.56**

So, the total ordering cost turned out to be **Rs. 522** approx.

- **Unit cost (C)** is Rs 300 as per the information taken from Purchase department.
- **Carrying cost** will be 10% as it includes:
- **Holding cost will** be 10% of the unit cost i.e Rs. 30

According to Richardso, Helen: Transportation & Distribution, December, 1995

warehouse expenses	2%
physical handling	2%
clerical and inventory control	3%
deterioration and pilferage	3%
TOTAL CARRYING COST	10%



The above graph shows that the EOQ level for bedsheet in Jaypee hospital is 173. At this level we have the minimum holding cost and ordering cost i.e Rs. 2595 and Rs. 2745 each.

Pillow covers

For pillow covers the Volume per order of 2 years is taken.

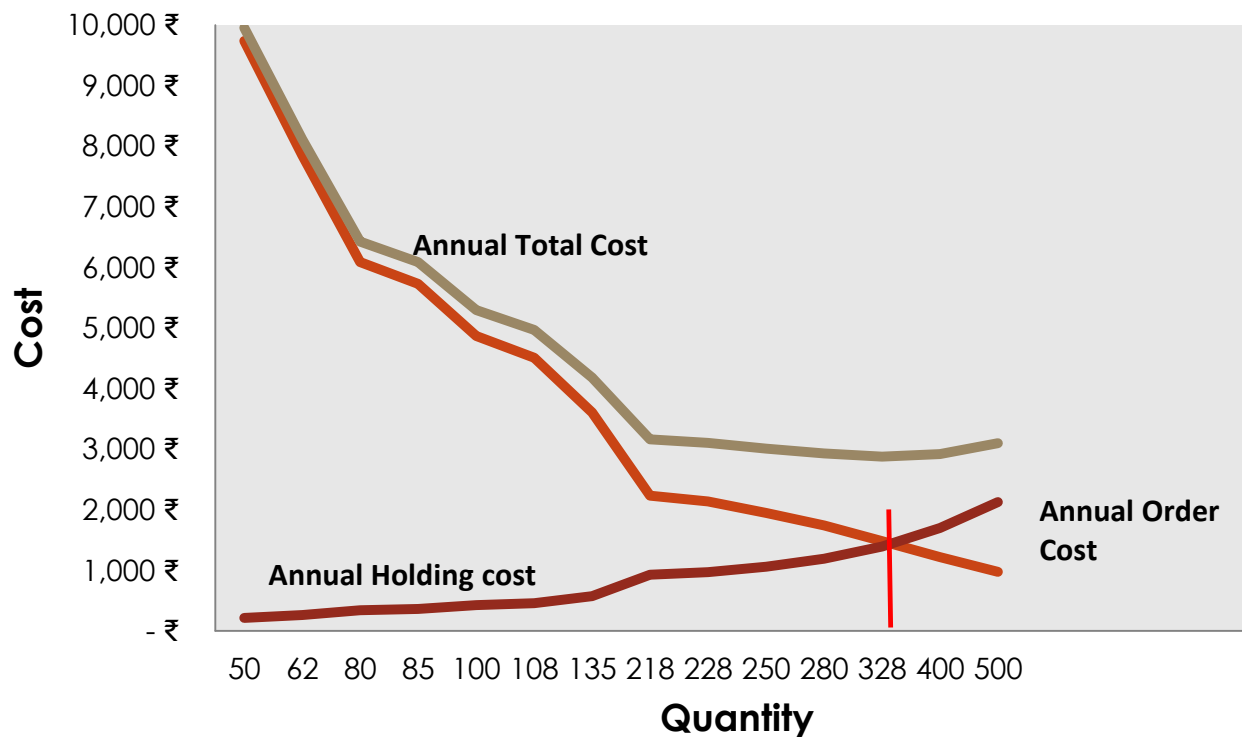
- **Actual demand (D)** = $311 \times 3 = 933$ same as the bed sheets.
- **Ordering cost (S)** = Rs. 522
- **Unit cost (C)** = Rs. 85
- **Carrying Cost** = 10%
- **Holding Cost** = Rs. 9

On putting the values in the formula, EOQ is calculated to be **328**

However, it was noticed that the volume of order was only reaching maximum to 250 in volume per order.

Therefore to achieve the EOQ level, the hospital needs to order 328 pillow covers to have the minimum holding and ordering cost as shown in the below graph.

Economic Order Quantity (Pillow Cover)



The above graph shows that the EOQ level for bed sheet in Jaypee hospital is 328. At this level we have the minimum holding cost and ordering cost i.e Rs. 1394 and Rs. 1485 each.

Nursing uniform

For Nursing uniform the Volume per order of 2 years is taken.

- **Actual demand (D)**

On an average 525 nurses are present in the hospital. Each nurse is allotted with three sets of dresses.

Therefore, demand will be **1575 sets**

- **Ordering cost (S) = Rs. 522**

- **Unit cost (C) = Rs. 480**

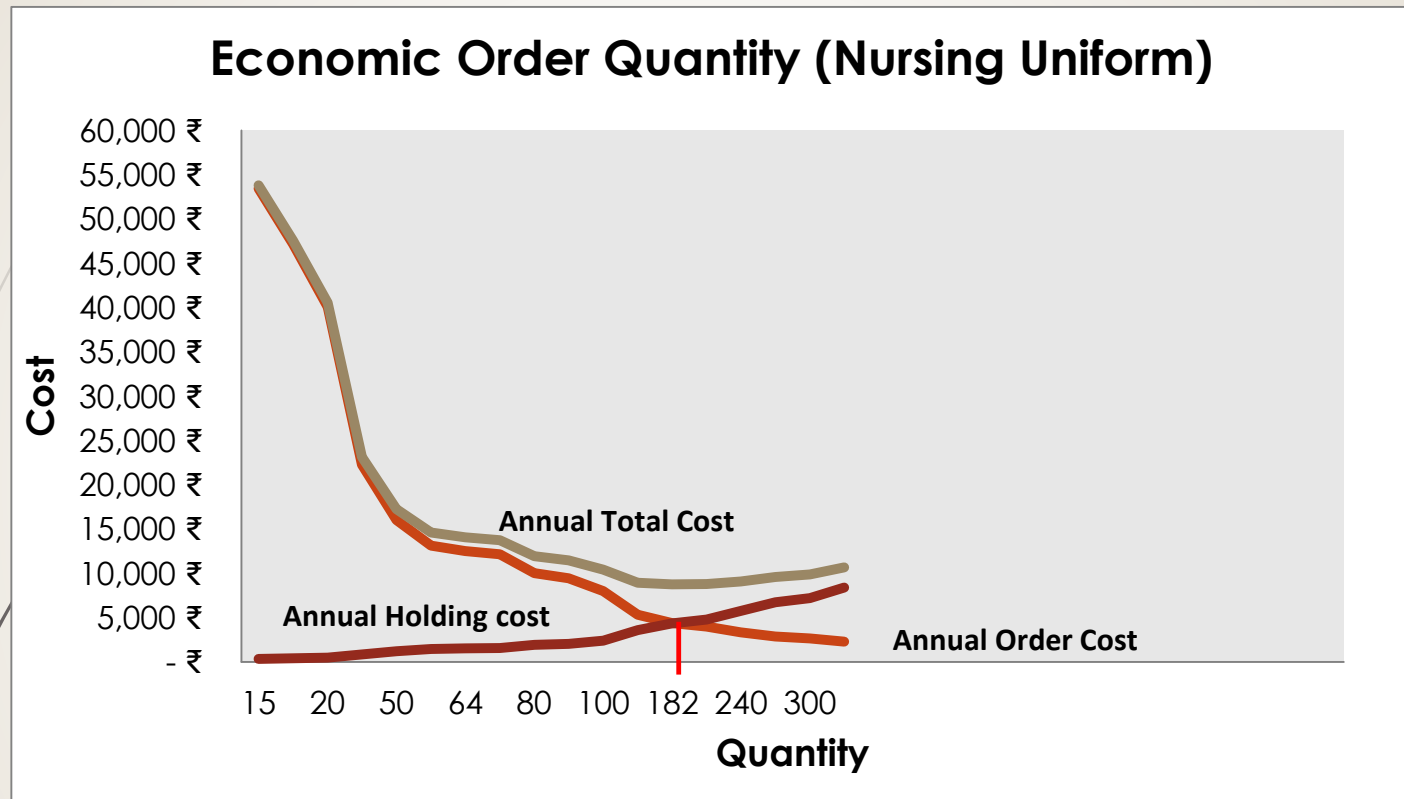
- **Carrying Cost = 10%**

- **Holding Cost = Rs. 48**

On putting the values in the formula, EOQ is calculated to be **182**

However, it was noticed that the volume of order was only reaching maximum to 66 in volume per order.

Therefore to achieve the EOQ level, the hospital needs to order 182 nursing uniform to have the minimum holding and ordering cost as shown in the below graph.



The above graph shows that the EOQ level for Nursing Uniform in Jaypee hospital is 182. At this level we have the minimum holding cost and ordering cost i.e Rs. 4368 and Rs. 4405 each

Patient dress

For Patient dress the Volume per order of 1 year is taken.

- **Actual demand (D)**

On an average 2992 In-patients are admitted to the hospital per month. Each patient is allotted with two sets of dresses.

Therefore, demand will be **5984 sets**

- **Ordering cost (S) = Rs. 522**

- **Unit cost (C) = Rs. 550**

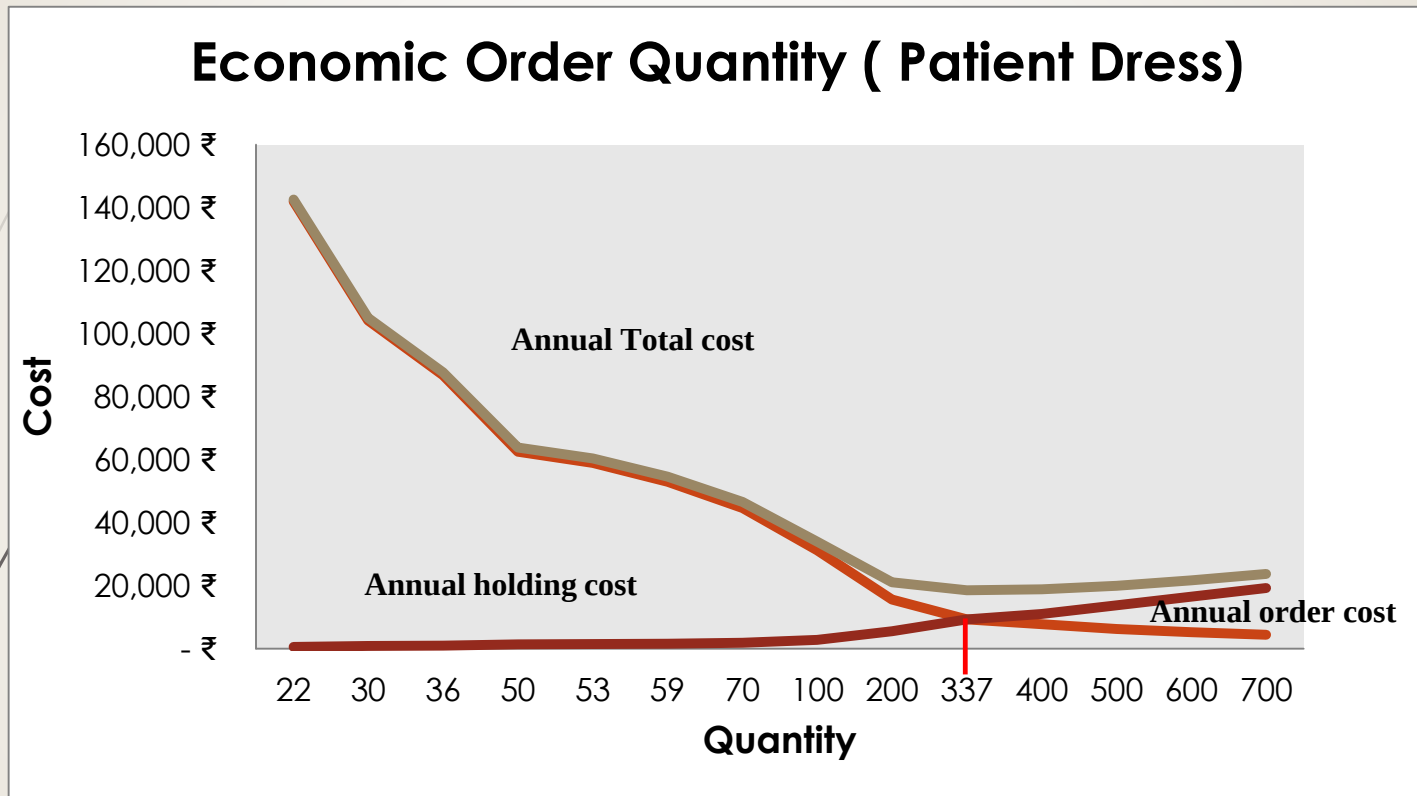
- **Carrying Cost = 10%**

- **Holding Cost = Rs. 55**

On putting the values in the formula, EOQ is calculated to be **337**

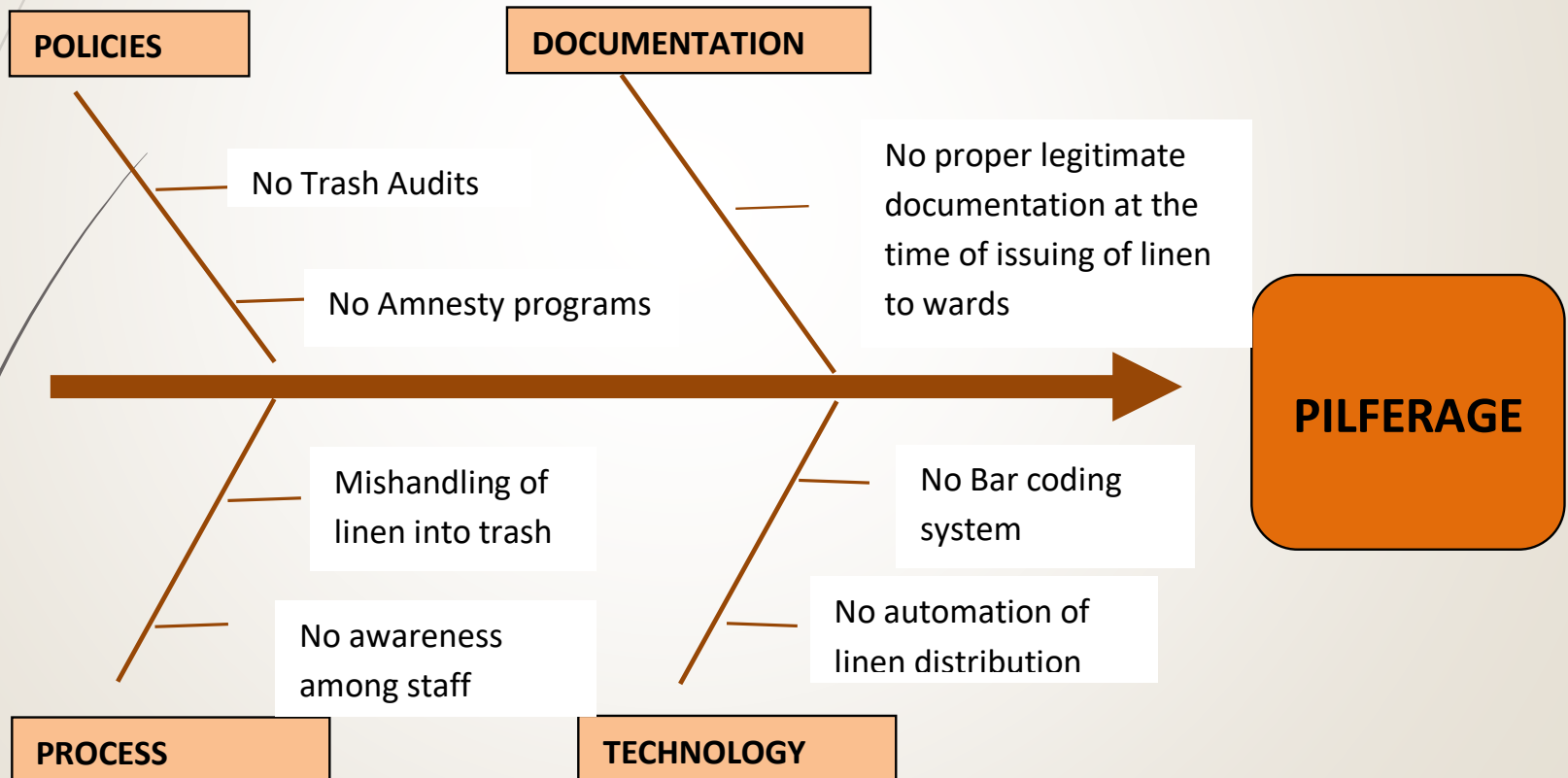
However, it was noticed that the volume of order was only reaching maximum to 100 in volume per order.

Therefore to achieve the EOQ level, the hospital needs to order 337 patient dresses to have the minimum holding and ordering cost as shown in the below graph.



The above graph shows that the EOQ level for Nursing Uniform in Jaypee hospital is 337. At this level we have the minimum holding cost and ordering cost i.e Rs. 9268 and Rs. 9269 each

Root Cause Analysis for linen loss



Suggestions for linen loss

1. Linen awareness and education program

➤ Linen awareness day:

A day can be dedicated to Linen awareness day. The purpose of this day will be to educate hospital staff about how the Linen and Laundry department operates. Displays can be presented to demonstrate the importance of linen conservation and the cost associated with it. Each session would include-

Introduction to linen service provider.

- ✓ Education on wash process.
- ✓ How specific linen item should be used.
- ✓ Issue of excess linen in patient rooms.
- ✓ Unauthorized scrub use.
- ✓ Discharge bed make-up policy.

➤ Linen tip of the month:

Every month a tip regarding linen handling, proper use of linen etc. can be displayed in the hospital notice board or the areas where it can be noticed by maximum number of staff.

Contd.

➤ **Laundry tours:**

Laundry tours can be organized by the linen and laundry department to make the employees aware about the whole operations that take place in the department and also to educate them about the cost of linen loss

➤ **Pamphlets/ Posters for education:**

Similarly pamphlets can be made available for the staff and the patients to educate them regarding the proper use of linen.

2. Proper documentation record

A proper daily linen exchange format should be prepared and printed and should be followed while delivering linen to every department.

3. Trash Audits

Regular trash audits should be conducted to avoid the disposal of the linen by mistake and also to determine the extent of linen problem. Many a times heavily soiled linen are discarded with other discard able items.

LINEN TIP



Scrubs should only be worn by specific clinical staff within the hospital



- Patients should wear hospital PJ bottoms and hospital gowns – NOT scrubs.
- Patients should never wear scrubs home.

LINEN TIP



USE THE CORRECT BAG!

LINEN bags are for **LINEN**

TRASH bags are for **TRASH**



Towels, washcloths, sheets, blankets, scrubs, etc.



Adhesives/bandages, wipes, disposable pads, gloves

Trash in the laundry can cause ruined linens – and also problems inside the laundering equipment.

Linen Tip of the Month



Don't Trash Linen

- All linen can be laundered.
- Place all soiled linen in leak proof linen hamper bags.
- Trashing linen adds to Hospital expense.

LINEN DELIVERY RECORD SHEET

Time of request (Date, Time)	Time of delivery (Date, Time)	Items requested	Name of the staff delivering	Name of the staff receiving	Signature

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THANK YOU
