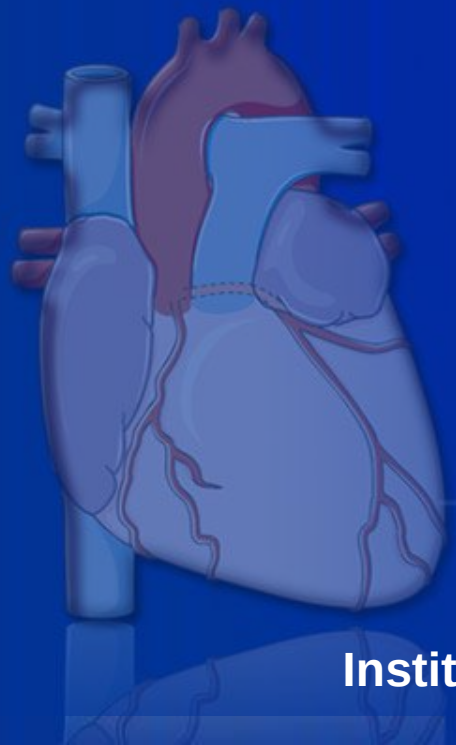
# INTERNSHIP TRAINING

**Lt Col Rajesh Singh**
**Bath 17**
**Post Graduate Diploma in Hospital Management**

**2012-14**



IIHMR JAIPUR

**Institute of Health Management Research, Jaipur**

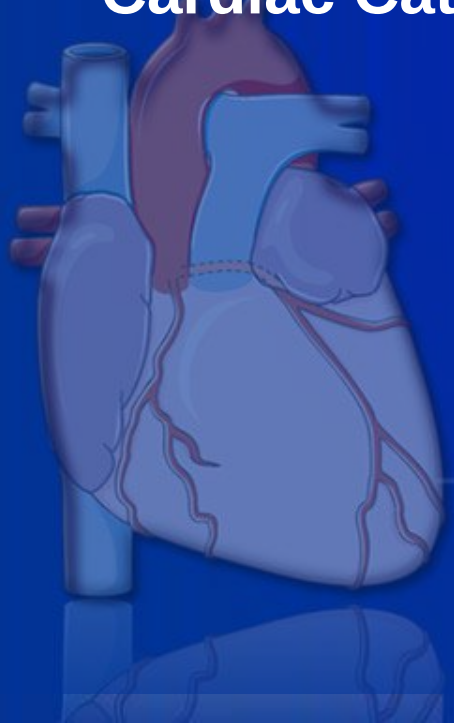
**DISSERTATION**

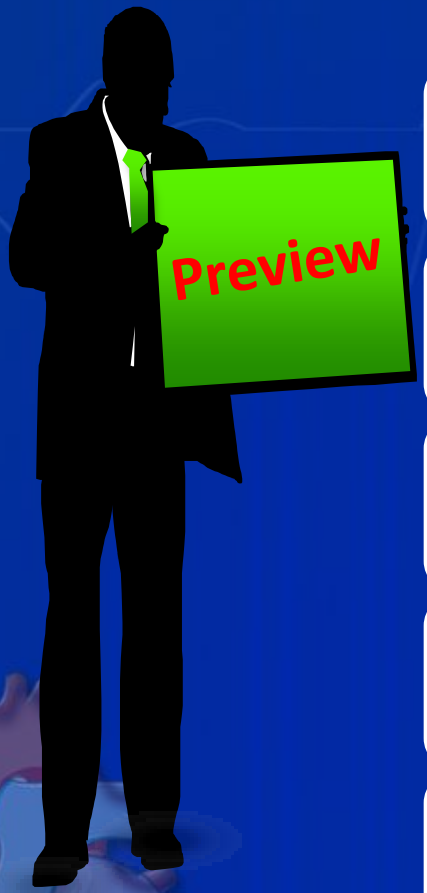
**IN**

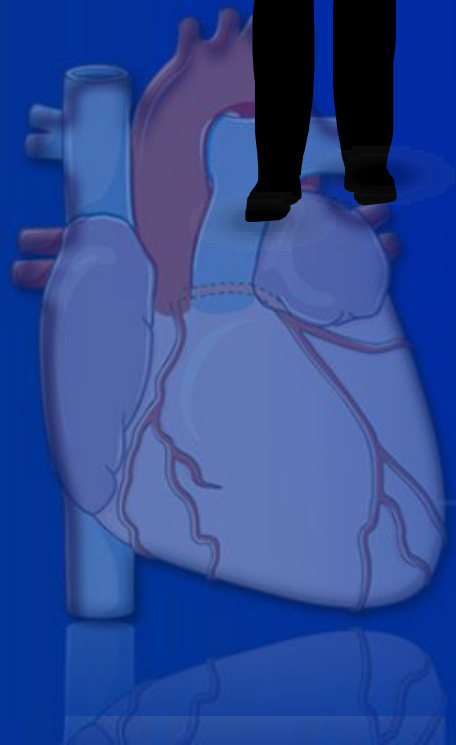
**SONI MANIPAL HOSPITAL, JAIPUR**

**(FEBRUARY 18, 2014 – APRIL 30, 2014)**

**To analyse the cost of various procedures performed in Cardiac Catheterization Laboratory of a multispecialty hospital**





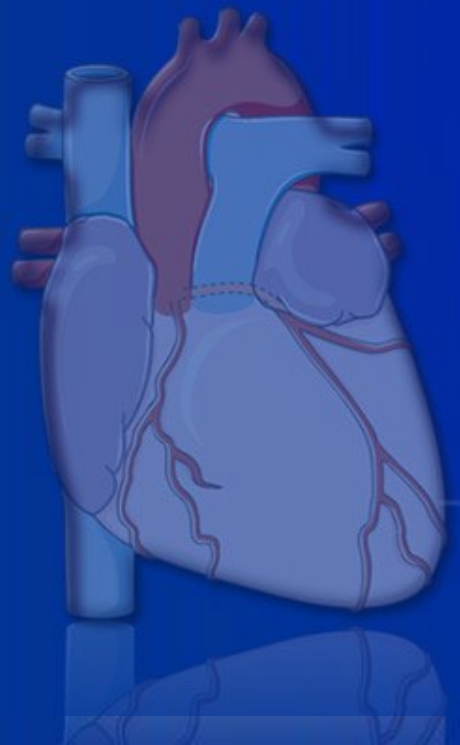



- Introduction
- Aim and Objective
- Methodology and Data collection
- Cost calculations of procedures
- Inference
- Limitation of study
- Recommendation and Conclusion

# INTRODUCTION

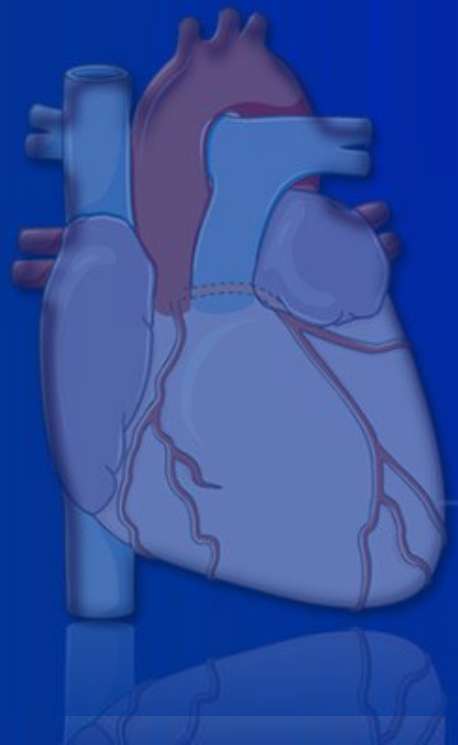
## Soni Manipal Hospital

- Established in 1991
- 204 bedded hospital
- Multispecialty
- NABH and NABL accredited
- Reputed Emergency Department
- Reasonable Packages



# CATHETERIZATION LABORATORY

- Diagnostic imaging equipments
- Visualizes heart chambers & arteries
- Use of catheter
- Biplane digital X-rays
- Procedures-CAG, PTCA, PPI, TPI, Balloon septostomy



# AIM & OBJECTIVE OF STUDY

***AIM***

Analyzing the cost of various procedures charged from a patient in Cardiac Catheterization Laboratory in a multispecialty hospital.

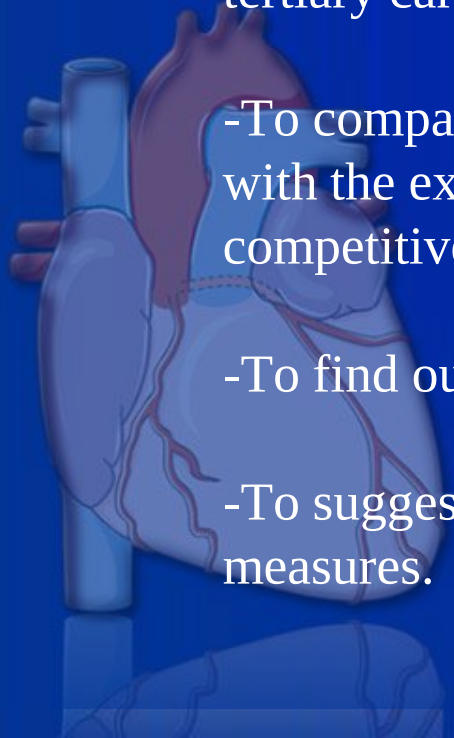
*Objectives.*

-To find out the actual cost of package of CAG, PTCA and PPI to a tertiary care hospital under the study.

-To compare the actual costing of package of CAG, PTCA and PPI with the existing tariff to find out variations in cost of packages for competitive pricing.

-To find out wastages in Cath lab procedures

-To suggest the measures to reduce the wastages and cost saving measures.



# METHODOLOGY AND DATA COLLECTION

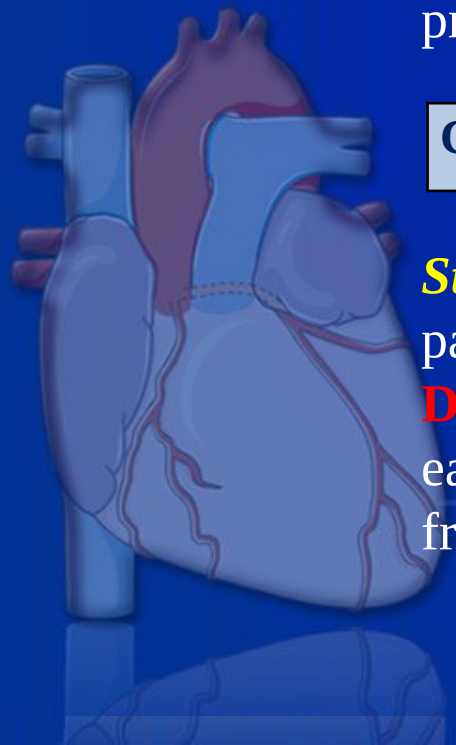
***Study Setting*:** Soni Manipal Hospital, Jaipur.

***Study Period*:** Feb 1st to April 30th 2014

***Study Population***: various procedures performed in Cath Lab for in patients and outpatient.

***Study Sample*:** Total number of CAG, PTCA, PPI and others procedures carried out in year 2013.

| | | | | |
|---|---|---|---|---|
| **CAG- 641** | **PTCA - 322** | **PPI - 28** | **Others - 110** | **Total - 1101** |



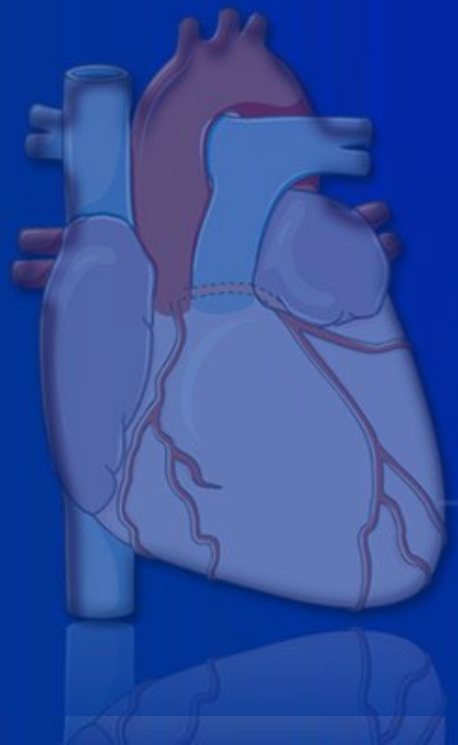
***Study design*:** This descriptive study is done on cost of various packages performed in Cath lab. Costing was studied under **Direct cost** and **Indirect cost**. After calculating the actual cost of each procedure, it was compared with the price being charged from the patient to set its credibility.

# Actual cost of package is calculated by the following framework:

**Actual cost of package** → **Direct labour cost +direct material cost +over-head cost**

**Direct material cost** →
- Cost of stay in CCU
- Medicine cost
- Cost of consumables
- Cost of Diagnosis

**Over-head cost** →
- Electricity cost
- Equipment cost
- Depreciation charges of building
- Cath lab maintenance charges
- Charges due to inventory



***Primary data*:**

By visiting Cath Lab to observe directly.

Records from registers already maintained.

Discussing with surgeons, Cath Lab staff, head nurse and managerial staff.

***Secondary data*:**

Internet search engines.

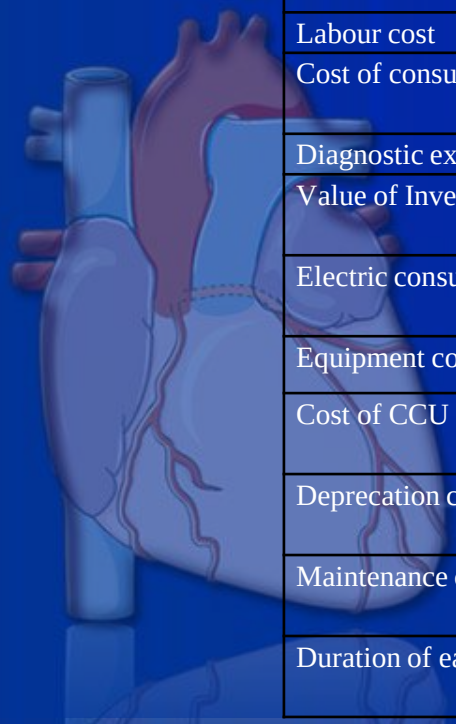
Hospital management information system.

Previous studies of Cath lab.

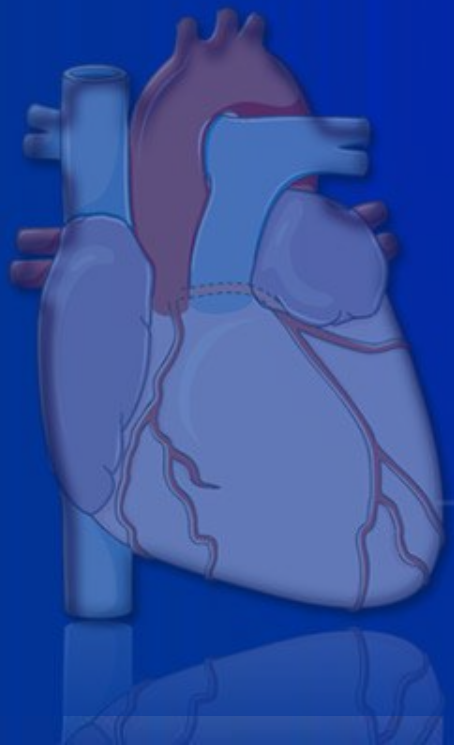
***Data collection method:***

Following framework was used to collect the required data:

| Data | Source | Tool | Remark |
|---|---|---|---|
| Total procedures in Cath Lab in 2013 | HMIS | Check list | Excel sheet was used |
| Labour cost | Cath lab,HMIS | List | Direct observation |
| Cost of consumables | Cath lab ,CCU medical store | Check list | Direct observation |
| Diagnostic expenditure | CCU, Lab, store | Check list | |
| Value of Inventory | Cath lab records, store ledger | Check list | |
| Electric consumption | Cath lab, maintenance dept. | Check list | |
| Equipment cost | Cath lab, store, HMIS | Check list | |
| Cost of CCU stay | CCU | Check list | Direct observation of 45 procedure |
| Deprecation cost | Cath lab, internet, Account dept. | Check list | |
| Maintenance cost | Cath lab, internet, Account dept. | Check list | |
| Duration of each procedure | Cath lab | Check list | Direct observation of 45 procedures |

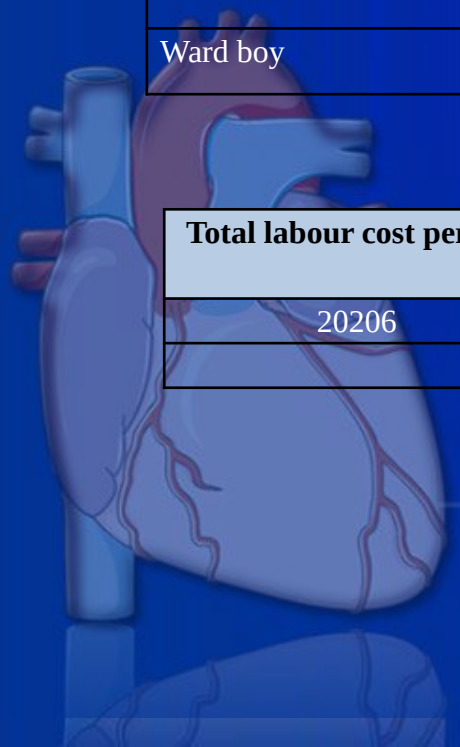


# ***COST CALCULATIONS OF PROCEDURES***



# DIRECT LABOR COST OF CATH LAB

| STAFF | MONTHLY SALARY | PER DAY COSTING TO HOSPITAL (Rs) |
|---|---|---|
| Doctor | 400000 | 15384 |
| Cath lab incharge | 46500 | 1788 |
| Senior technician | 18600 | 715 |
| Shift incharge nursing | 17000 | 653 |
| Junior technician | 11059 | 425 |
| Senior scrub nurse | 12410 | 477 |
| Junior technician | 7400 | 284 |
| Nurse | 6500 | 250 |
| Ward boy | 6000 | 230 |



| Total labour cost per day | Total working hour | Cost per hour | Cost per minute (Rs) |
|---|---|---|---|
| 20206 | 08 | 2525 | 43 |
| | | | |

# COST OF CONSUMABLES AND MEDICINES FOR CORONARY ANGIOGRAPHY

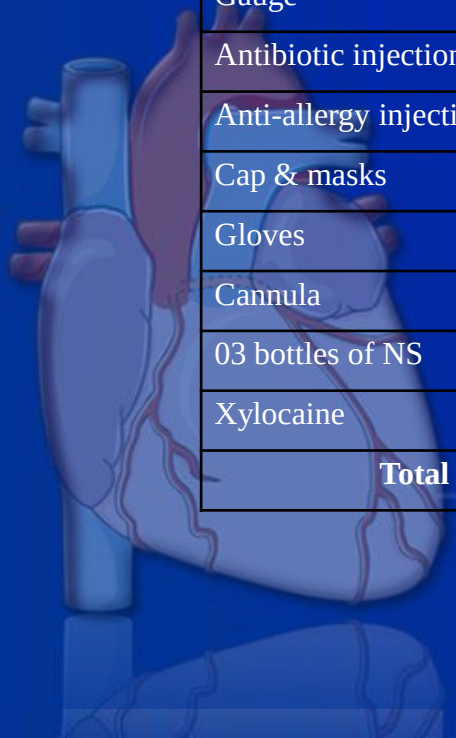
| ITEM | COST (Rs) | REMARK |
|---|---|---|
| 3 pair of gloves | 15 | |
| 3 10 ml syringe | 9 | |
| One dye bottle | 800 | Non-ionic |
| Lever lock syringe | 5 | |
| Puncture needle | 18 | |
| Catheter | 70 | One catheter used for 5 cases after proper E.T.O sterilization |
| Guide wire | 35 | One wire used for 10 case after proper E.T.O sterilization |
| 2 NS bottle | 26 | |
| Pressure line | 3 | One line used for 10 case after proper E.T.O sterilization |
| Three way valve | 20 | |
| Cotton & gauge | 10 | |
| Xylocaine | 80 | |
| Uro bag | 25 | |
| sheath | 350 | |
| Surgical blade | 15 | |
| **Total** | 1481 | |

# COST OF CONSUMABLES AND MEDICINES FOR PTCA PROCEDURE

| ITEM | COST (Rs) | REMARK |
|---|---|---|
| Guiding catheter | 520 | One catheter used for 5 cases after proper E.T.O sterilization |
| PTCA wire | 640 | One wire used for 5 cases after proper E.T.O sterilization |
| Pressure syringe | 500 | One used for 5 cases after proper E.T.O sterilization |
| Easy catheter | 200 | One used for 5 cases after proper E.T.O sterilization |
| Guide wire | 50 | One wire used for 10 cases after proper E.T.O sterilization |
| Gloves | 15 | |
| 05 syringes | 15 | |
| 02 bottles of dye | 1600 | Non-ionic |
| 02 heparin injections | 70 | |
| Avil injections | 10 | |
| Hydrocortisone injection | 30 | |
| Antibiotic injections | 150 | |
| 04 bottles of NS | 55 | |
| NTG injections | 25 | |
| 04 tablets of clopidogril | 15 | |
| Xylocaine | 80 | |
| Cotton & gauge | 20 | |
| Uro bag | 25 | |
| Lever lock syringe | 5 | |
| Sheath | 350 | |
| Puncture needle | 18 | |
| Pressure line | 25 | |
| **Total** | 4418 | |

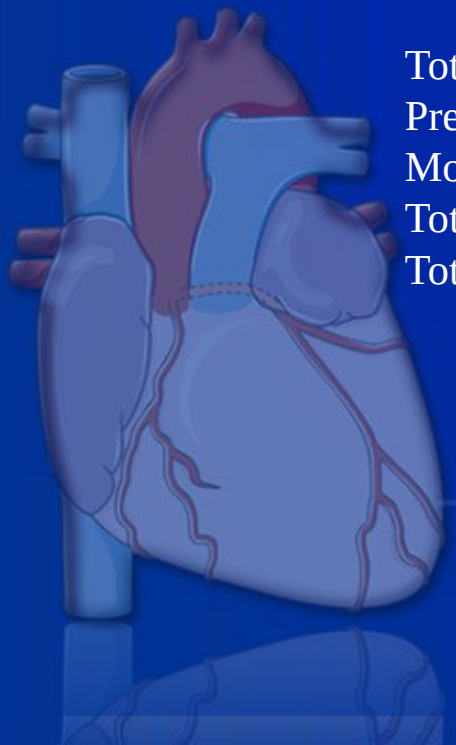
# COST OF CONSUMABLES AND MEDICINES FOR PPI

| ITEM | COST (Rs) | REMARK |
|---|---|---|
| Two 10 ml syringe | 5 | |
| 100 ml of betadine | 50 | |
| Dermincise | 40 | |
| Dynaplast | 375 | |
| Surgical blades | 15 | |
| Tegadrum | 150 | |
| Suture material | 150 | |
| Gauge | 20 | |
| Antibiotic injections | 100 | |
| Anti-allergy injections | 10 | |
| Cap & masks | 10 | |
| Gloves | 60 | |
| Cannula | 50 | |
| 03 bottles of NS | 50 | |
| Xylocaine | 80 | |
| **Total** | 1165 | |



# VALUE OF INVENTORY HELD WITH CATH LAB ON MONTHLY BASIC

| Item | Quantity | Cost (Rs) |
|---|---|---|
| BMW wire | 4 | 12000 |
| Easy catheter | 7 | 6300 |
| Guiding wire | 4 | 1500 |
| D-syringe | 4 | 8000 |
| Balloon | 4 | 36000 |
| Dye bottles | 8 | 6400 |
| Pressure line | 10 | 220 |
| Assorted syringes | 15 | 70 |
| **total** | | **70490** |

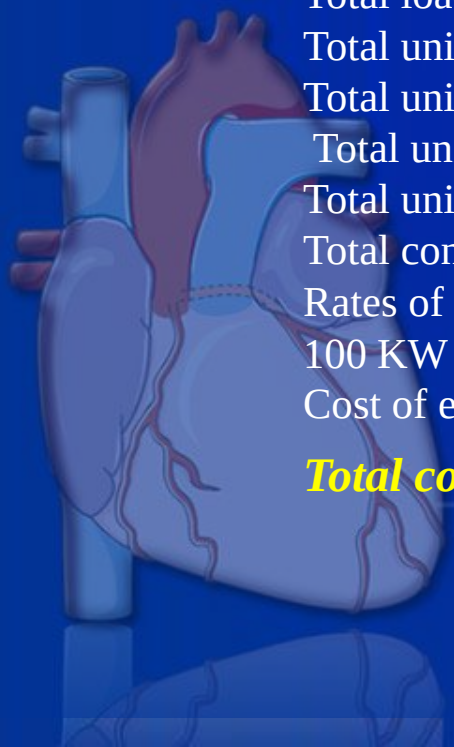


Total inventory cost at the end of month – Rs 70490
Prevailing bank of interest ( per month ) for hospitals – 1.25%
Monthly interest per month on Cath Lab inventory - 881
Total interest on inventory of Cath Lab in a Year - 10572
Total cases of CAG,PTCA and PPI in year 2013 = 991

***Extra amount incurred per case because of inventory*** **– Rs 11**

# ELECTRICITY CONSUMPTION AND COST IN CATH LAB

| Head | load |
|---|---|
| Cath Lab machine | 120 KW |
| A.C and air handling unit | 7 KW |
| Lighting | 1.5 KW |
| Miscellaneous equipments | 1.5 KW |
| **Total Load** | 130 KW |

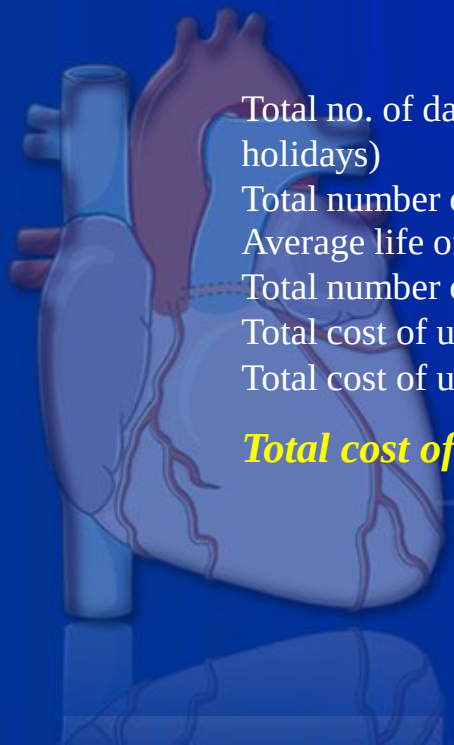


Total load per hour – **130 KW** ( when all things are running )
Total units of electricity consumed in air handling unit in 8 hrs – **56 units**
Total units consumed in lighting in 8 hrs – **12 units**
Total units consumed in one hr by cath lab machine – **120 units**
Total units consumed by misc equipments in 8 hrs – **12 units**
Total consumption of electricity in one min – 2.16 **units**
Rates of per unit in Jaipur – Rs 6 per unit for commercial units having load more than 100 KW
Cost of electricity per minute in Cath Lab – Rs 13

***Total cost of electricity in Cath Lab per minute*** **– 13 + 10% extra = Rs 14.5**

# COST OF USE OF EQUIPMENT IN CATH LAB

| Equipment | Cost in Rs |
|---|---|
| Cath Lab Machine | 24500000 |
| Defibrillator | 120000 |
| Pacemaker | 150000 |
| IABP machine | 1470000 |
| ACT machine | 107000 |
| Syringe pump | 38000 |
| Cold storage | 25000 |
| Data recorder & CD burner | 50000 |
| **Total** | **26460000** |



Total no. of days Cath Lab functions in a year - 26*12-15 = **297 days** (26 days in a month, 15 national holidays)
Total number of hrs Cath Lab functions in a year - 297 *8 = **2376 hrs**
Average life of equipments in Cath Lab as per literature **– 10 years**
Total number of hrs available from these equipments **–** 2376*10 = 23760 **hrs**
Total cost of use of the equipments **–** 26460000
Total cost of use of the equipments per hour is 26460000/23760 = **1114**

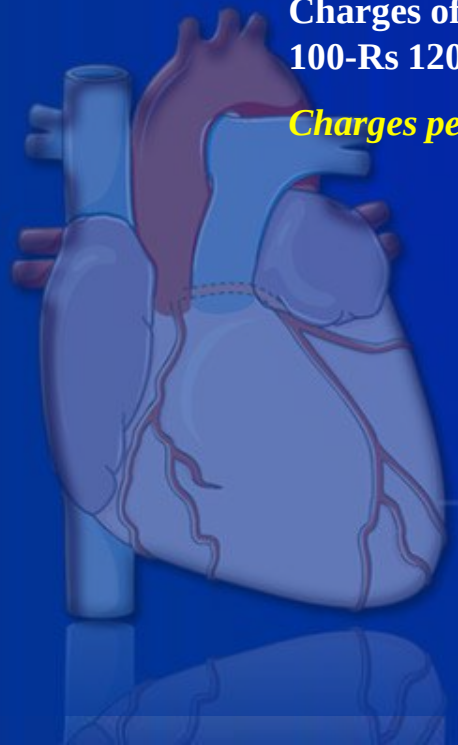
***Total cost of use of equipment per minute in Cath Lab is* = Rs 19**

# COST OF STAY IN CCU PRE AND POST CATH LAB PROCEDURES

| Procedure | Pre procedure | Post procedure | Total in hrs | Cost (Rs) |
|---|---|---|---|---|
| Angiography | 2 | 10 | 12 | **2004** |
| PTCA | 2 | 48 | 50 | **8350** |
| PPI | 2 | 70 | 72 | **12024** |

**Charges of CCU for 24 hrs – 4000 (including food and linen charges which are about Rs 100-Rs 120 per day per patient)**

***Charges per hr for CCU stay* – Rs 167**



# DEPRECATION COST OF THE CATH LAB ON VARIOUS PROCEDURES

| AREA | SIZE IN SQFT |
|---|---|
| Entrance corridor | 110 |
| Scrub area | 130 |
| Main console room | 142 |
| Cath lab | 766 |
| **Total** | 1148 |

Construction cost of such nature building (including flooring, cladding, walls treatment, false ceiling e.t.c +10% extra to cater for wastages & modifications for equipments) **– Rs 2000**
Total cost of construction of Cath lab is **Rs 2296000**
Life of building on average before requiring any major repair **– 20 years**
Annual deprecation of the building at the rate of 5% per annum - **114800**

*Depreciation charges for various procedures are as follows*:

| Package | Total cases | % share of deprecation | Depreciation charges per procedure (Rs) |
|---|---|---|---|
| CAG | 641 | 64.68 | 116 |
| PTCA | 322 | 32.49 | 116 |
| PPI | 28 | 2.82 | 116 |
| **Total** | 991 | 100 | 348 |

# MAINTENANCE COST OF CATH LAB

Total area of the Cath lab **– 1148 sq ft**
As per MES services the building and electrical maintenance cost(per sq mtrs) is**723** and **719** respectively.
Total maintenance charges are **–** 135 **per sq ft**
Total maintenance cost is - **154980**
***Maintenance charges of building for various procedures are as follows***:

| Package | Total cases | % share of maintenance cost | maintenance charges per procedure (Rs) |
|---|---|---|---|
| CAG | 641 | 64.68 | 157 |
| PTCA | 322 | 32.49 | 157 |
| PPI | 28 | 2.82 | 157 |
| **Total** | 991 | 100 | 471 |

***Fumigation and General cleaning of Cath Lab***
Fumigation and cleaning is carried out by the Cath Lab staff only, thus only the cost of material used and no labour cost is included.

| | |
|---|---|
| Cost of fumigation material used in one month | 100 |
| Cost of material used in 2013 | 1200 |
| Total procedures done in Cath Lab | 991 |
| Cost per procedure | 1.5 |

| Package | maintenance charges per procedure (Rs) |
|---|---|
| CAG | 157+1.5+10=168 |
| PTCA | 168 |
| PPI | 168 |
| **Total** | **Rs 504** |

# DURATION OF PROCEDURES DONE IN CATH LAB

***Observed timings for 24 procedures of CAG (in minutes )***

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 38 | 42 | 41 | 45 | 38 | 37 | 37 | 38 | 40 | 41 |
| 40 | 39 | 38 | 40 | 39 | 38 | 41 | 37 | 38 | 39 |
| 40 | 39 | 39 | 38 | **Total time** | **961** | | **Average time** | **40** | |

*Observed timings for 16 procedures of PTCA ( in minutes )*

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 72 | 69 | 69 | 70 | 71 | 69 | 69 | 70 | 73 | 75 |
| 69 | 69 | 70 | 70 | 69 | 70 | | | | |
| | | | | **Total time** | **1118** | | **Average time** | **70** | |

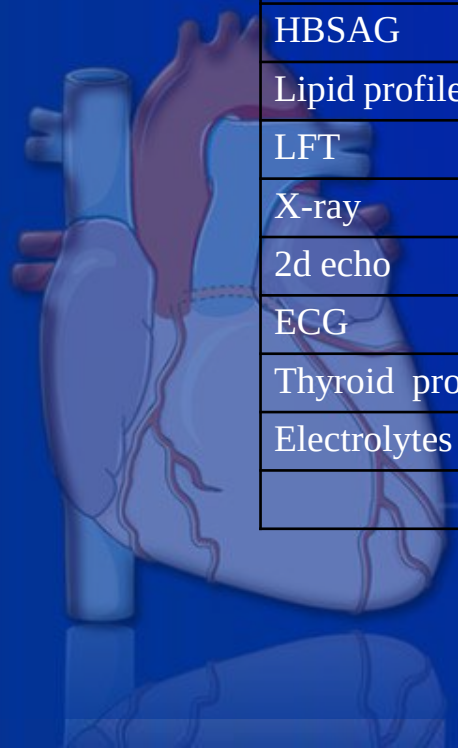
*Observed timings for 5 procedures of PPI ( in minutes )*

| | | | | |
|---|---|---|---|---|
| 102 | 99 | 98 | 101 | 102 |
| **Total time** | **502** | | **Average time** | **100** |

| Procedure | Duration in mins |
|---|---|
| CAG | 40 |
| PTCA | 70 |
| PPI | 100 |

# DIAGNOSTIC EXPENDITURES FOR VARIOUS PROCEDURES IN CATH LAB

| Test | Cost in Rs |
|---|---|
| CBC | 100 |
| Urea | 40 |
| S. Creatinine | 40 |
| HIV I & II | 160 |
| Blood sugar | 35 |
| HBSAG | 120 |
| Lipid profile | 190 |
| LFT | 180 |
| X-ray | 200 |
| 2d echo | 180 |
| ECG | 150 |
| Thyroid profile | 180 |
| Electrolytes | 90 |
| **Total** | **Rs 1665** |



# ACTUAL EXPENDITURE ON CAG PROCEDURE

***Calculation of day to day operational cost per procedure***

| Head | Cost in Rs |
|---|---|
| CCU stay | 2004 |
| Consumables | 1481 |
| Direct labour cost | 1720 |
| Diagnostic cost | 1665 |
| **total** | 6870 |

***Calculation for overhead cost per procedure***

| Head | Cost in Rs |
|---|---|
| Electricity cost | 580 |
| Equipment cost | 760 |
| Depreciation charges of building | 116 |
| Cath lab maintenance charges | 168 |
| Charges due to inventory | 11 |
| **Total** | 1624 |

***Actual cost of performing CAG procedure in Cath Lab* = 6870+1624=Rs 8494**

***Comparison of actual versus charged cost in the package for CAG***

| Procedure | Actual cost | Package cost | Inference |
|---|---|---|---|
| CAG | 8494 | 10000 | Rs 1506 margin |

# ACTUAL EXPENDITURE ON PTCA PROCEDURE IN CATH LAB

***Calculation of day to day operational cost per procedure***

| Head | Cost in Rs |
|---|---|
| CCU stay | 8350 |
| Consumables | 4418 |
| Direct labour cost | 3010 |
| Diagnostic cost | 1665 |
| **total** | 17443 |

***Calculation for overhead cost per procedure***

| Head | Cost |
|---|---|
| Electricity cost | 1015 |
| Equipment cost | 1330 |
| Depreciation charges of building | 116 |
| Cath lab maintenance charges | 168 |
| Charges due to inventory | 11 |
| **Total** | 2629 |

***Actual cost of performing CAG procedure in Cath Lab = 17443+2629=Rs 20072***

***Comparison of actual versus charged cost in the package for CAG***

| Procedure | Actual cost | Package cost | Inference |
|---|---|---|---|
| PTCA | 20072 | 50000 | Rs 29928 margin |

# ACTUAL EXPENDITURE ON PPI PROCEDURE IN CATH LAB

***Calculation of day to day operational cost per procedure***

| Head | Cost in Rs |
|---|---|
| CCU stay | 12024 |
| Consumables | 1165 |
| Direct labour cost | 4300 |
| Diagnostic cost | 1665 |
| **total** | 19154 |

***Calculation for overhead cost per procedure***

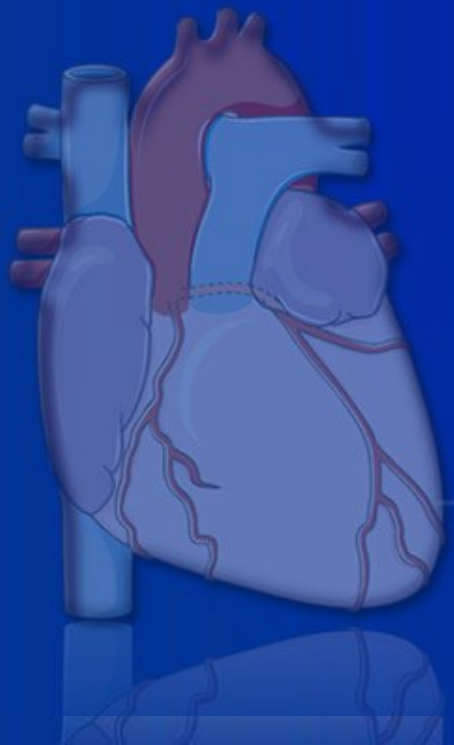
| Head | Cost in Rs |
|---|---|
| Electricity cost | 1450 |
| Equipment cost | 1900 |
| Depreciation charges of building | 116 |
| Cath lab maintenance charges | 168 |
| Charges due to inventory | 11 |
| **Total** | 3634 |

***Actual cost of performing CAG procedure in Cath Lab = 3634+19154=Rs 22788***

***Comparison of actual versus charged cost in the package for PPI***

| Procedure | Actual cost | Package cost | Inference |
|---|---|---|---|
| PPI | 22788 | 25000 | R 2212 margin |

# INFERENCE



# CAG PACKAGE

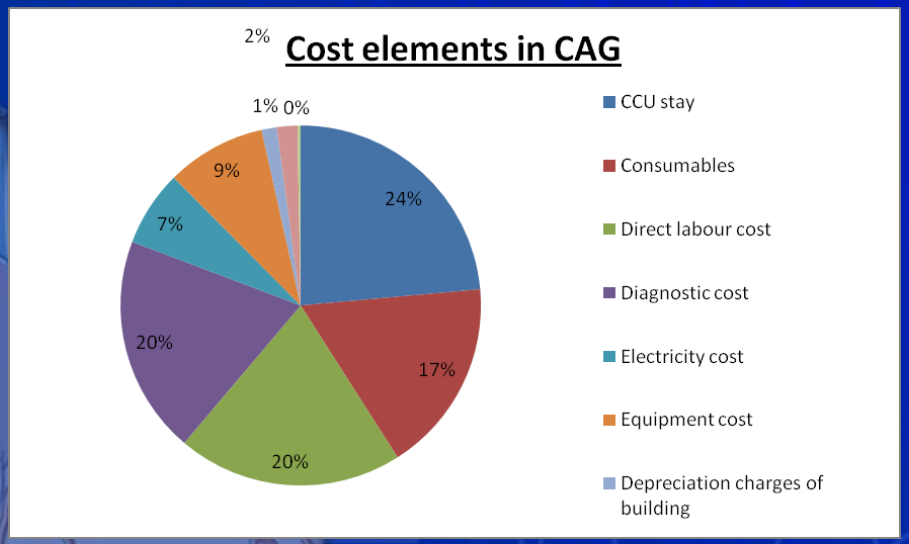
•CAG procedures are about **63%** of total procedures done in Cath Lab in 2013

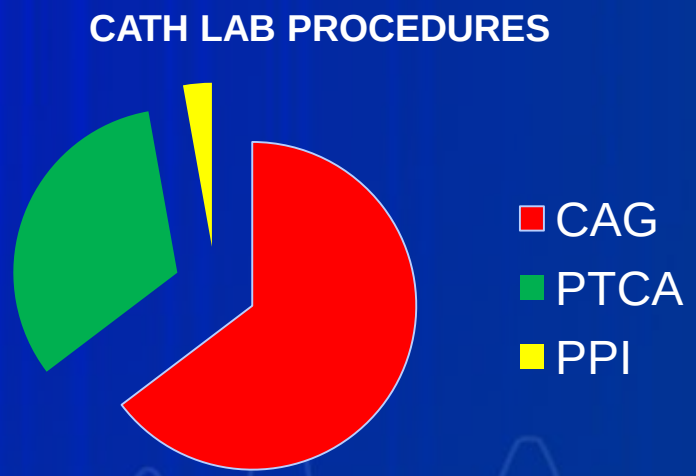
•Cost of CAG package is just adequate with a buffer amount of **Rs 1506**. This buffer amount can easily cater for any fluctuation in external market and keep package price unchanged and self sustained.

•Hospital is not making any noticeable profit from CAG package (**17% only**).Total revenue generated in 2013 from this is **Rs 965346**.

•CAG procedures seems to be for patient's welfare in terms of quality care under one roof and is bringing fame to Hospital.

Major cost element in CAG procedures is stay in CCU and labour cost.

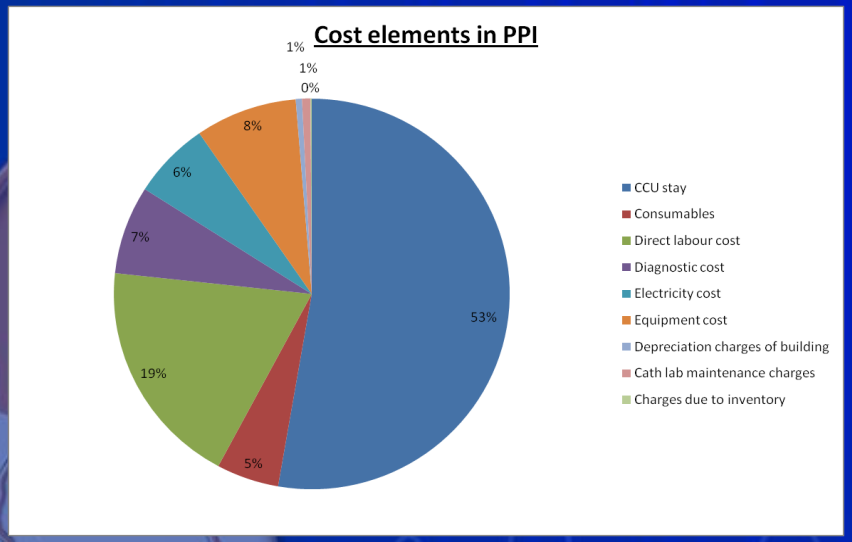


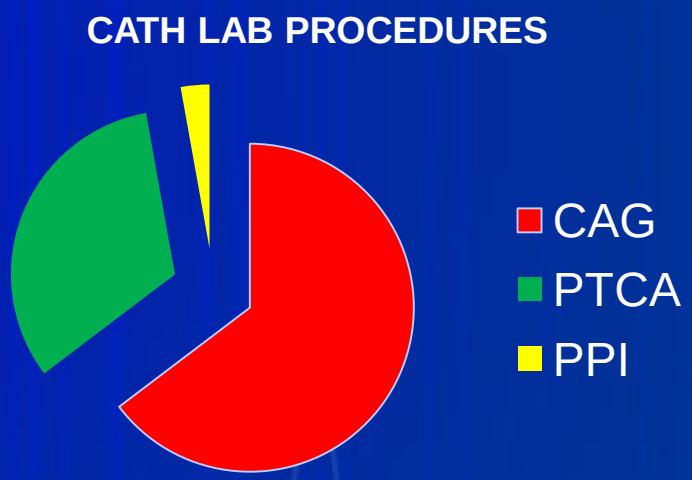




| Cost element | Cost |
|---|---|
| Stay in CCU | Rs 2004 ( 24% of total cost ) |
| Labour cost | Rs 1720 ( 20% of total cost ) |

# PPI PACKAGE

- PPI procedures are about **2.8%** of total procedures done in Cath Lab in 2013
- Cost of PPI package is just adequate with a buffer amount of **Rs 2212**. This buffer amount can easily cater for any fluctuation of external market and keep package price same and self sustained.
- Hospital is not making any noticeable profit from PPI package (**9.7% only**).Total revenue generated in 2013 from this procedure is **Rs 712264**.
- PPI procedures is just for patient's welfare in terms of quality care under one roof and is bringing fame to Hospital.
- Major cost element in PPI procedures is stay in CCU and labour cost.

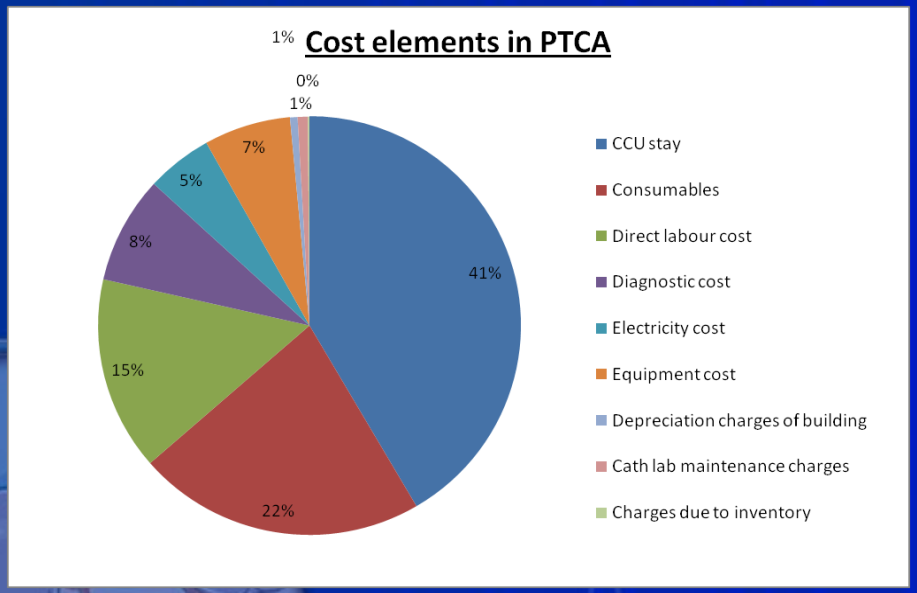


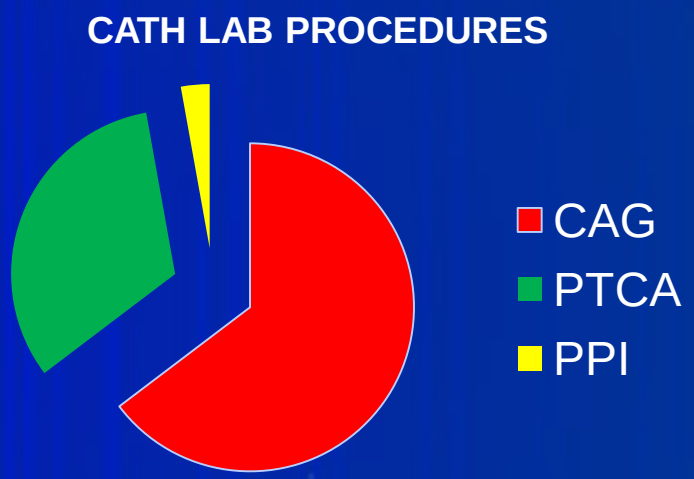




| Cost element | Cost |
|---|---|
| Stay in CCU | Rs 12024 ( 53% of total cost ) |
| Labour cost | Rs 4300 ( 19% of total cost ) |

# PTCA PACKAGE

•PTCA package is generating a fair amount of margin per procedure ( about 240% ).It's the major revenue generator procedure in Cath Lab.
•Number wise also its doing good ( about 33% of total procedures performed in Cath Lab ).
•Revenue generated by PTCA package in year 2013 alone is **Rs 9636816**
•Major cost element in PTCA procedures is stay in CCU and consumables.



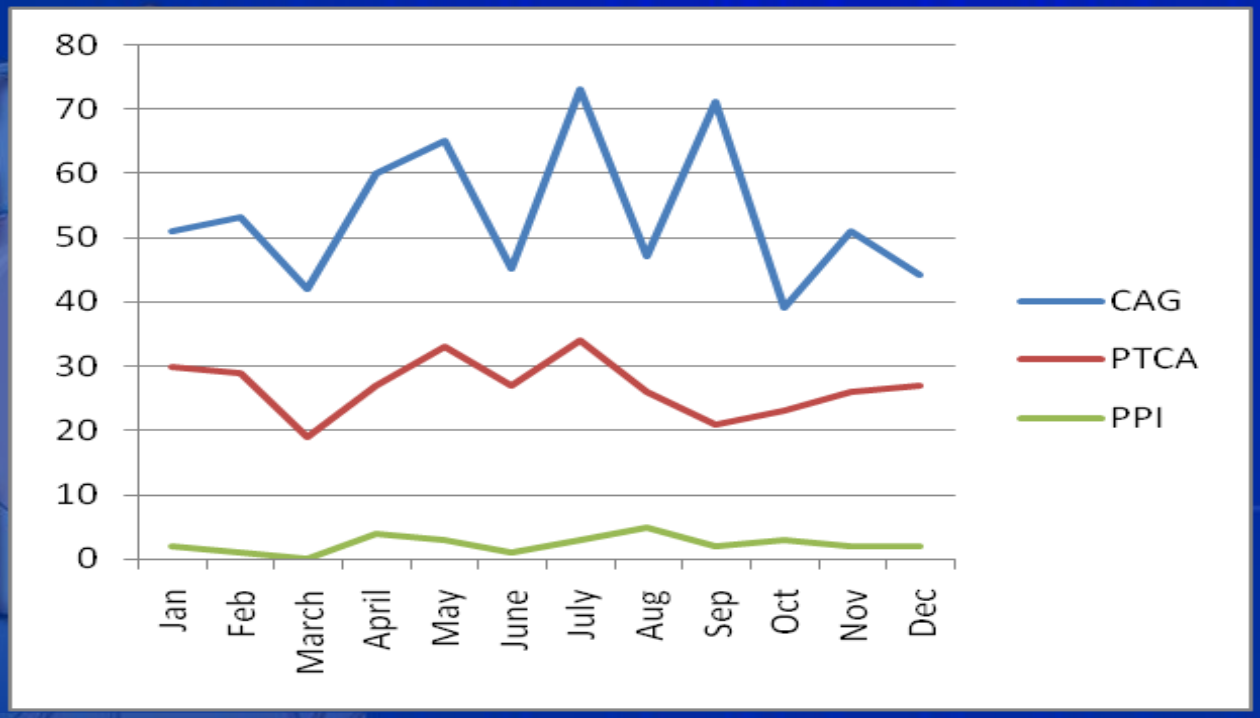




| Cost element | Cost |
|---|---|
| Stay in CCU | Rs 8350( 41% of total cost ) |
| Consumables | Rs 4418 ( 22% of total cost ) |

For this study only CAG, PTCA and PPI procedures were taken as they constitute about 93% of total cases undertaken in Cath Lab during year 2013.Actual cost of packages were then compared With the amount being charged from the patients. Margin amount for each package was as follows:

| Procedure | Margin amount (in Rs) |
|---|---|
| CAG | 1506 |
| PTCA | 29928 |
| PPI | 2212 |

***TREND OF CAG, PTCA AND PPI IN CATH LAB - 2013***



# LIMITATION OF STUDY

- There are few number of estimates, assumptions and flexible factors.
- No separate meters were available to measure the electricity and A/C consumption for each cost centre.
- Cost incurred from the patients perspective (travel expenditure, pre-Cath profile tests, lodging e.t.c ) have not been considered.
- The cost various with the kind of patient as some requires lengthy stay in CCU, some needs ventilator support e.t.c.
- Calculation shows the minimum amount which the hospital spends on each patient coming for various procedures.
- Enough number of patients were not there to record real time data in given span of time to derive any statistical standards and hence come to an amount which is close to actual spending by the hospital.
- Cost of consumables, medicines, maintenance of equipment, power charges e.t.c is also not static for long time and keeps on changing.

# RECOMMENDATIONS

## *To Increase the revenue*

- Bundle package system rather than individual packages
- Increase the number of procedures done in Cath lab.
- Focused and effective marketing strategies .

## *To decrease the cost of the procedure and overall package cost to hospital*

- Reduction in stay of patients in CCU.
- Separate catheterization ward.
- Continuous quality improvement (both pre and post procedure) and effective team management.
- Increase the number of procedures.
- Use of generic medicines can further reduce the cost of packages.
- Maximum possible items to be reused after deliberate inspection by Cath lab staff and proper ETO sterilization.
- **Material standardization** helps in reduction of costs to a great extend. Not only standardization of medicines and consumables be done but standardization of each and every item involved in patient care should be achieved

# CONCLUSION

- To reduce the overall cost of a procedure in a package payment method , hospital has to reduce the cost of stay in CCU and labour cost.
- In today's world when number of people are increasing with heart problems specially at young age ,it becomes very important for a Hospital to critically analyze the cost of any package so that maximum benefits can be delivered to the patient at the minimum cost and with least hassles. Moreover such exercise will generate more revenue for the hospital by increasing the number of patient in- flow and give better competitive standing

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# *Thanks*