

**To Analyse the Cost of Various Procedures Performed in Cardiac
Catheterization Laboratory of a Multispecialty Hospital**

**Internship Training
at
Soni Manipal Hospital, Jaipur**

**By
Lt Col Rajesh Singh**

**Under the guidance of
Dr Santosh Kumar**

**Post Graduate Diploma in Hospital & Health Management
2012–14**


**Institute of Health Management Research
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2014**

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TO WHOMSOEVER MAY CONCERN

This is to certify that Lt Col Rajesh Singh student of Post Graduate Diploma in Hospital Management (PGDHM) from Institute of Health Management Research, Jaipur has undergone internship training at S K Soni-Manipal Hospital from 02 Feb 2014 to 30 Apr 2014.

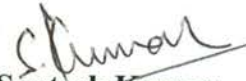
The Candidate has successfully carried out the study designated to him during internship training and his approach to the study has been sincere, scientific and analytical.

The internship is in the fulfilment of the course requirements.

I wish him all the success in the future endeavours.



Col. (Dr.) Ashok Kaushik
Dean, Academic and Student Affairs
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Dr. Santosh Kumar
Associate Professor
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SMH/HR/TC/015

Date: 17/05/2014

To whomsoever it may concern

This is to certify that **Lt. Col. Rajesh Singh** pursuing his Post Graduate Diploma in Hospital and Health Care Management at IIHMR, Jaipur has completed his Dissertation Project on **“Cost Analysis of packages in Cath Lab”** at Soni Manipal Hospital, Jaipur from 18th February 2014 to 30th April 2014.

We wish him all success in future.

For Soni Manipal Hospital
(A Unit of Manipal Hospitals (Jaipur) Private Limited)


Nagendra Kumar,
Dy. Manager HR

Soni Manipal Hospital

Manipal Hospitals (Jaipur) Private Limited

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Lt Col Rajesh Singh

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ABBREVIATIONS

OT	Operation Theatre
HMIS	Hospital Management Information system
CATH LAB	Catheterization Laboratory
CAG	Coronary Angiography
PTCA	Percutaneous transluminal coronary angioplasty
PPI	permanent pacemaker implantation BMV
CCU	Cardic care unit
CBC	Complete blood count
LFT	Liver function test
ACT MACHINE	Activated clotting time
IABP MACHINE	Intra-aortic balloon pump
BMW WIRE	Balance Middle Weight

1. INTERNSHIP REPORT

HOSPITAL PROFILE



Soni Manipal Hospital: Manipal Hospital is a landmark health care entity in the whole of South India. From the year 1991 when it was first set up, it has grown in strength to become the flagship hospital of the Manipal Hospitals group. Situated in Vidhyadhar Nagar, this hospital provides 204 beds and a team of highly experienced doctors and support staff. State-of-the-art equipment and world-class facilities have provided millions of national and international patients with exemplary health care. Being the nerve centre of the Manipal Hospitals Group, it provides path breaking care in niche fields like liver, kidney and bone marrow transplants, besides 55 other specialties. Manipal Hospital is also highly regarded as a specialty referral centre in India.

Soni Manipal hospital is a 204 bedded super specialty tertiary care hospital, truly futuristic in its services and technology and brings together some of the most talented medical professionals. The institute provides preventive, diagnostic, therapeutic, rehabilitative, and palliative and support services under one roof and is designed to meet patient care and research requirements of the new millennium.

SPECIALTIES OFFERED

Oncology, Cardiac Diseases, Renal Diseases, Neonatal, Pediatric /Medical & Cardiac Intensive care, Orthopedics, General Surgery, Nephrology, Endocrinology, Gastroenterology, General Medicine, Gynecology, Pediatrics, Laboratory Medicine, Neurology, Ophthalmology, Radiology, Pulmonology, Urology, Aesthetic & Cosmetic Surgery, Dermatology, Pulmonary Medicine, ENT, Physiotherapy, Critical care, Dental, Alternative Medicine.

SUMMARY OF THE JOB

- Worked as a team member in Cath lab .
- To study the day to day functioning and various other managerial aspects of Cath lab.
- To find out the actual cost incurred to hospital on various procedures carried out in Cath lab

The following are the responsibilities assigned to me by the organization

- To gather the information about the functioning of Cath Lab
- To collect information on various equipments used in Cath Lab
- To study the Patient flow in Cath lab for various procedures
- To calculate the actual cost of various heads involved in a procedure in Cath Lab
- To find out the time of various procedures in Cath Lab
- To compare the actual cost of a procedure from what is charged from a patient.

2. DISSERTATION REPORT

2.1 INTRODUCTION

A Catheterization laboratory or Cath lab is an examination room in a hospital or clinic with diagnostic imaging equipment used to visualize the arteries of the heart and the chambers of the heart and treat any stenosis or abnormality found. Most Catheterization laboratories are "single plane" facilities, those that have a single X-ray generator source and an image intensifier. The latest digital Cath labs are biplane (have two X-ray sources) and digital, flat panel labs.

Cardiac Catheterization" is a general term for a group of procedures that are performed using this method, such as coronary angiography, as well as left ventricle angiography. Once the Catheter is in place, it can be used to perform a number of procedures including angioplasty, PCI (percutaneous coronary intervention) angiography, balloon septostomy, and an Electrophysiology study or Catheter ablation.

Package payments began as early as 1984 when The Texas Heart Institute under the direction of Denton Cooley began to charge flat fees for both hospital and physician services for cardiovascular surgeries.

Package pricing, is defined as the reimbursement of health care providers (such as hospitals and physicians) "on the basis of expected costs for clinically-defined episodes of care. It has been described as "a middle ground" between fee-for-service reimbursement (in which providers are paid for each service rendered to a patient) and capitation (in which providers are paid a "lump sum" per patient regardless of how many services the patient receives).Package payments have been proposed in the health care reform debate in the United States as a strategy for reducing health care costs, especially during the Obama administration.

A key factor for a more rapid move towards universal health coverage is the efficient use of resources, coupled with increased resource mobilization and improved pooling. Substantial efficiency gains could be made by reforming hospital payment mechanisms.

An effort has been made to study each and every aspect of that factor which contributes towards the cost of any procedure carried out in Cath lab. Cost of each part is then pooled together to arrive at actual costing to the hospital and finally compared with the charges of the package offered to the patient.

2.2 REVIEW OF LITERATURE

Cardiac Catheterization is one of the most common invasive procedures performed. Although the benefits of cardiac Catheterization remain great, the large number of procedures performed coupled with infrequent but potentially significant complications make the cardiac Catheterization laboratory an important environment in which to constantly strive to improve quality. Although optimal patient outcomes remain paramount, state and national regulatory requirements, public reporting, and payers' interests in both outcomes and cost raise the importance of quality measurement and improvement in the cardiac Catheterization laboratory.

In a real-world setting, many administrators struggle to balance pinching pennies and delivering care. As hospital reimbursement dwindles and innovation blossoms, hospital staff must find creative ways to save a buck without skimping on care. Staff members from three hospitals share solutions ranging from data dissemination to innovation to physician engagement.

- Centers for Medicare & Medicaid Services- [http://www. Cms.hhs.gov/apps/media/press](http://www.Cms.hhs.gov/apps/media/press)
- Interventional cardiac Catheterization procedures-article by Panchamukhi VB, Flaker GC.
- Cost-cutting Strategies that Deliver: Three Solutions for the Cath Lab- by Kaitlyn Dmyterko on [Www.cardiovascularbusiness.com](http://www.cardiovascularbusiness.com)
- Quality Measurement and Improvement in the Cardiac Catheterization Laboratory- by Paul Frey, MD, MPH; Ann Connors, RN; Frederic S. Resnic, MD, msc
- Hospital Management Accounting- by G.R.Kulkarni
- Cost savings and physician responses to global bundled payments for Medicare heart bypass surgery- Health Care Financ Rev 19 (1): 41–57
- Bundled Payments: What Physicians Need to Know- by Shelly K. Schwartz, Physicians Practice
- Overview of bundled payment- RAND Corporation.
- Payment reform options: episode payment is a good place to start-Health Aff (Millwood)
- Medicare-payment fix weighed- Wall Street Journal. Retrieved 2010-03-11.
- Emerging practices in cost management- by Barry J. Brinker

2.3 EXECUTIVE SUMMARY

Cost management is one of the critical success factors for the hospitals. It provides information for strategic, operational, clinical and human resource decision making. Cost analysis would help to arrive at the cost of production of every unit by close analysis of expenditure. It indicates to the management any uneconomic use or waste which is thereby revealed. It also aids in pricing and to furnish data for decisions.

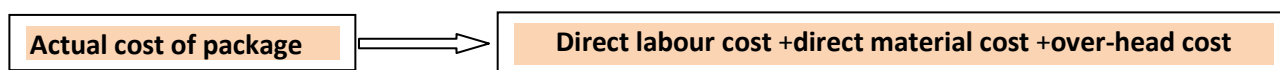
The Study focuses on the ascertaining the cost of providing the service and to assess whether the packages are cost worthy or not. This study is carried out in the Cardiac Catheterization laboratory of Soni Manipal Hospital, Jaipur, Rajsthan.

The cost of services also influences revenue to the extent that they influence pricing decisions. Hospital must remain profitable in order to serve the community effectively and to embrace capital markets for plant and technology modernization.

In Cath Lab of Soni Manipal Hospital ,Jaipur CAG,PTCA,PPI, EP STUDY, BMV,TPI,RFA,PTA IABP and DSA procedures are done out of which CAG,PTCA and PPI are common (CAG-63%,29% PPI-3% and rest-9%).These procedures are offered in form of package by hospital .Each package includes everything from door to door other than any implant & treatment of any associated complications. Total stay in CCU and time in Cath Lab for CAG, PTCA, and PPI were as follows:

Procedure	Stay in CCU	Cath Lab Time (in minutes)
CAG	12	40
PTCA	50	70
PPI	72	100

Cost of each package was calculated under two heads-Direct cost and in-direct cost.It was further sub-divided into various cost elements like cost of stay in CCU, medicines, consumable, diagnosis Electricity, equipment, depreciation of building, maintenance, dead inventory, house-keeping, food & linen and labour cost. Actual cost of each package was calculated using the following formula:



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

2.4 GENERAL NORMS FOR THE CATH LAB

a. Location of Cath Lab

The Cath lab should be located in such a way that it is not located near the area where patient and other movement is high. It should be easily assessable from O.T, SSD, and Cardiac Care Unit. Its location should not be on ground floor but easily approachable from Emergency. Preferably there should be separate lift and staircase for this complex.

b. Power supply system

There should be separate power back-up system (UPS) for Cath lab in case of main supply failure and to cater for delay in generators start-up. Moreover the supply to Cath Lab should be filtered for any spikes and voltage fluctuations.

c. Staff

It should have staff specially trained & experienced in all the procedures carried out in the Cath Lab. 25% extra staff should be on payroll to cater for leave, emergencies and for un-interrupted functioning of Cath Lab.

d. Financial Strategy

Owners and physician/users of cardiac Catheterization labs (Cath labs) may be missing out on an opportunity to increase their respective cash flows and to further enhance their business relationships with each other. The use of lease agreements and purchased services agreements can provide the mechanisms to enhance revenues, more fully utilize facility resources, prevent the loss of cardiac care patients to competing facilities, and avoid costly and duplicate capital outlays.

e. Inpatient versus outpatient setting for procedures

Although outpatient procedures have become common there is less uniformity in patient and parent suitability for hospital discharge shortly after Catheterization than in adult patients. Infants and young children cannot be instructed or expected to remain still without moving their legs for a period after a procedure used in adults. For these reasons, it is suggested that overnight observation be anticipated and allowed whenever there is any concern about patient safety.

Nonetheless, a set of written criteria should be established for same-day Catheterization and discharge. These criteria would account for differences in procedure type, patient age and expected compliance, parent or guardian reliability, travel distance, procedure duration and time of completion, and the cardiac physiology in determining which patients are eligible for discharge on the day of Catheterization.

f. Quality management

Quality management in the Catheterization laboratory must include: 1) an effective and ongoing educational program in the diagnostic use of X-rays, 2) accurate monitoring and timely reporting of personnel exposure, and 3) modification of procedural conduct in those cases where exposure levels are of concern. These issues are addressed earlier in this document (see QA Issues in the Cardiac Catheterization Laboratory).

g. Minimum caseload volumes

The use of a specific minimum number of cases to define the quality of operator performance is obviously fraught with problems. There have been no data to justify the prior recommendation of at least 150 cases/year. The minimum diagnostic caseload for the entire laboratory also varies widely from state to state.

In general, the minimum interventional caseload of 75 procedures/year for operators and a minimum performance of 200 cases/year by institutions, with the ideal being 400 cases/year per laboratory, both reasonable and supportable.

Issues of training, competency, and operator volume are important.

h. QA issues in the cardiac Catheterization laboratory

The modern cardiac Catheterization laboratory is an amalgamation of complex, highly sophisticated medical and radiological instrumentation used in the diagnosis and management of patients with not only chronic stable disease, but also acute life-threatening illnesses. In any complex, procedure-oriented area, it is necessary to have a well-organized program of QA that focuses on individual and laboratory outcomes. In addition, a continuous program of quality improvement (QI) should be implemented to provide ongoing feedback and structure for change. The required components are: 1) clinical proficiency, 2) equipment maintenance and management, and 3) a QI process and 4) radiation safety.

i. Procedures carried out in cath lab

Cardiac Catheterization is a general term for a group of procedures that are performed using this method, such as coronary angiography, as well as left ventricle angiography. Once the Catheter is in place, it can be used to perform a number of procedures including angioplasty, PCI (percutaneous coronary intervention) angiography, balloon septostomy, and an Electrophysiology study or Catheter ablation.

This technique has several goals:

- Confirm the presence of a suspected heart ailment
- Quantify the severity of the disease and its effect on the heart
- Seek out the cause of a symptom such as shortness of breath or signs of cardiac insufficiency
- Make a patient assessment prior to heart surgery

j. A list of procedures carried out in a Cath Lab are:

- Coronary Angiography or Coronary Catheterization
- Coronary Angioplasty or Percutaneous coronary intervention / PCI
- Closure of some congenital heart defect
- Treatment of stenotic heart valves
- Permanent and temporary pacemaker implantations
- Electrophysiological studies such as AV node ablation
- Rotablation of heavily Calcified vessels
- Left and right Sided pressure studies

2.5 AIM AND OBJECTIVES

a. AIM

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

b. Objectives

The study had the following objectives:

1. To find out the actual cost of package of CAG, PTCA and PPI to a tertiary care hospital under the study.
2. 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.
3. To find out wastages in Cath lab procedures
4. To suggest the measures to reduce the wastages and cost saving measures.

c. Methodology and data collection

Study Setting: Soni Manipal Hospital, Jaipur.

Study Period: Feb 1st to April 30th 2014

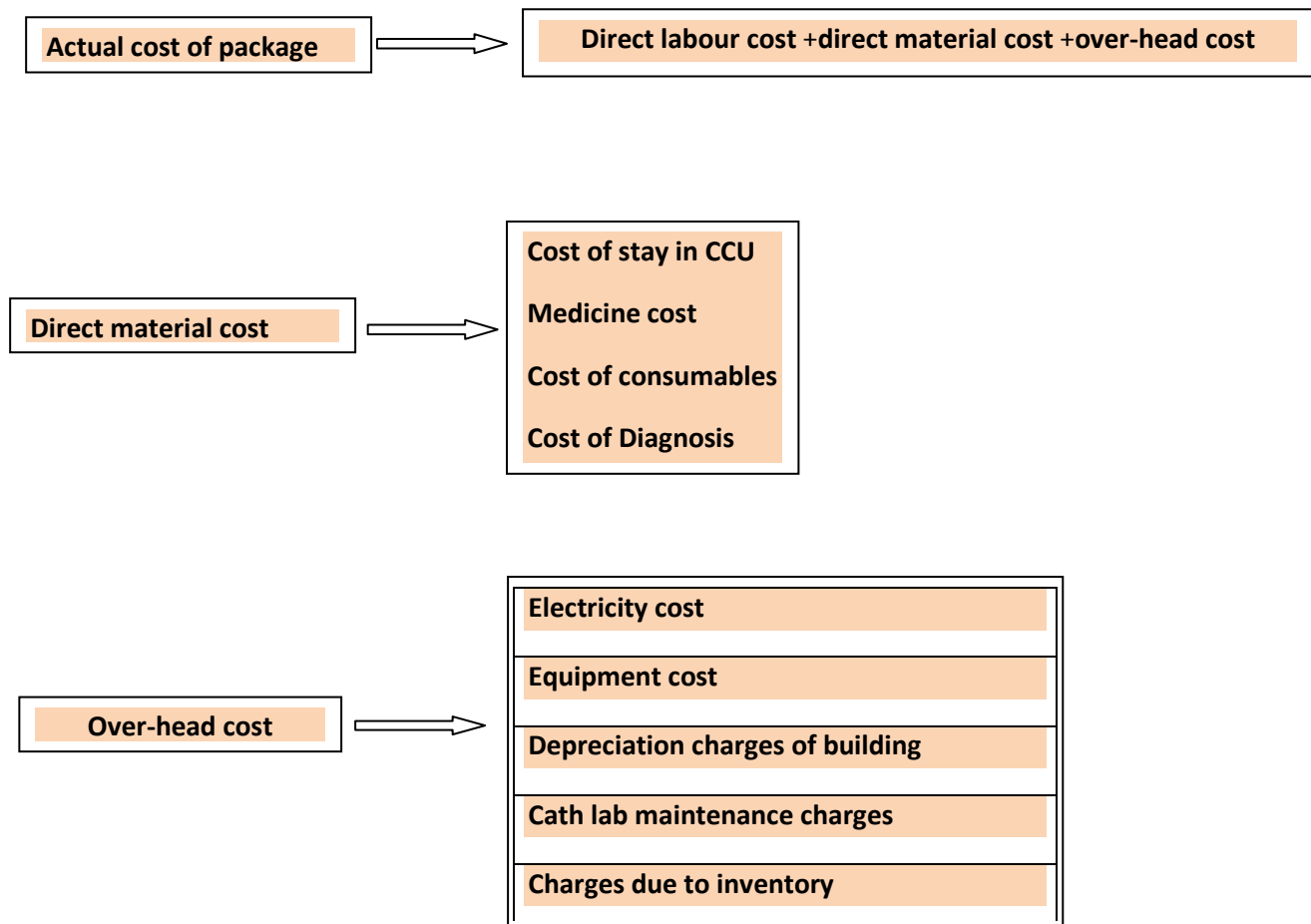
Study Population: various procedures performed in Cath Lab for in patients and outpatient.

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
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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 of package being charged from the patient to set its credibility.

Actual cost of package is calculated by the following framework:



d. Primary data:

1. By visiting Cath Lab to observe directly.
2. Records from registers already maintained.
3. Discussing with surgeons, Cath Lab staff, head nurse and managerial staff.

e. Secondary data:

1. Internet search engines.
2. Hospital management information system.
3. Previous studies of Cath lab.

f. 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

3. CALCULATION OF COST OF PROCEDURES IN CATH LAB

3.1 DIRECT LABOR COST OF CATH LAB

Following is the details of the salaries of various staff working in Cath lab of Soni Manipal Hospital.

STAFF	MONTHLY SALARY (Rs)	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

The cardiac Catheterization lab of this hospital works for 8 hours daily. Emergencies and special cases are different and are not included in this study as they are few. On an average 26 days are considered as working days in a month.

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

Per minute direct labour cost of Cath Lab – Rs 43

3.2 COST OF CONSUMABLES AND MEDICINES FOR CORONARY ANGIOGRAPHY

ITEM	COST	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	Rs 1481	

Note:

1. Above list of consumables is for a **routine case** with an **average use** of various items. It differs in special cases from patient to patient.
2. For making package **cost effective & competitive** few items are reused after deliberate inspection by Cath lab staff and proper E.T.O sterilization.
3. Cost is calculated based on average prevailing market rates.

Cost of consumables & medicines per case is- Rs 1481

3.3 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	

Note:

- Above list of consumables is for a **routine case** with an **average use** of various items. It differs in special cases from patient to patient.
- . For making package **cost effective & competitive** few items are reused after deliberate inspection by Cath lab staff and proper E.T.O sterilization.
- Cost is calculated based on average prevailing market rates.

Cost of consumables & medicines per case is- Rs 4418

3.4 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	

Note:

1. Above list of consumables is for a **routine case** with an **average use** of various items. It differs in special cases from patient to patient.
2. For making package **cost effective & competitive** few items are reused after deliberate inspection by Cath lab staff and proper E.T.O sterilization.
3. Cost is calculated based on **average** prevailing market rates.

Cost of consumables & medicines per case is- Rs 1165

3.5 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

Thus it is clear that inventory is managed in most optimum way and there is no sizeable burden on procedure cost because of dead stock in Cath lab.

3.6 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

Note:

- Additional consumption due to voltage fluctuation is not taken into account as difficult to measure correctly.
- Additional expenditure of units while running on power backup systems is not included as it is not fixed being dependent on fluctuating cost of fuel, batteries and gen-sets.
- 10% extra added because some equipment keeps working even if there is no procedure.
- Approximate consumption is taken as there is no separate electric meter for Cath Lab

3.7 EQUIPMENTS REQUIRED IN CATH LAB

Cardiac Catheterization requires some special instruments for carrying out various procedures. list of these instruments is as follows:

- a. Cath lab machine
- b. Defibrillator
- c. Pacemaker
- d. IABP machine
- e. ACT machine
- f. Syringe pump
- g. Cold storage

Other instruments required

- a. Electrocardiograph
- b. Sphygmomanometer
- c. Data recorder
- d. CD burner
- e. BP Transducers

Cost of major equipments

Equipment	Cost (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

3.8 COST OF USE OF EQUIPMENT IN CATH LAB

Total no. of days Cath Lab functions in a year - $26 \times 12 - 15 = 297$ **days** (26 days in a month, 15 national holidays)

Total number of hrs Cath Lab functions in a year - $297 \times 8 = 2376$ **hrs**

Average life of equipments in Cath Lab as per literature – **10 years**

Total number of hrs available from these equipments – $2376 \times 10 = 23760$ **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

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

Patients have to stay in CCU both pre and post various procedures in Cath Lab for the purpose of preparation and specialized care after the procedures. This stay may extend from few hrs to days depending upon the condition of patient to patient. Below table shows average stay for a routine patient. This is the minimum expense that the package should be able to cover. These charges are inclusive of the charges minor medication and any other support equipment used for the patient during his stay under the package deal.

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

Note:

- Calculations are done for a routine patient without any complications.
- Above values are based on the observations of 45 cases and their average taken out.

3.10 DEPRECIATION 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 depreciation of the building at the rate of 5% per annum - **114800**

Depreciation charges for various procedures are as follows:

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

3.11 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**

a. 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

b. 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

c. Final maintenance cost of Cath Lab for various procedures:

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

3.12 DURATION OF VARIOUS PROCEDURES (UNDER STUDY) DONE IN CATH LAB

a. 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	

b. 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	

c. 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

Note:

- Timings taken for a routine patient without any complications under all normal working conditions.
- These are the timings of procedures which were observed directly in Cath Lab.

3.13 DIAGNOSTIC EXPENDITURES FOR VARIOUS PROCEDURES IN CATH LAB

Various diagnostics tests are performed for a patient before he undergoes any procedures in a Cath Lab. Below is a list of mandatory tests which are carried out for all cases.

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

Note:

- o Above list of investigation is for a routine patient without any complications.
- o Cost is inclusive of everything-labour, regents, equipments e.t.c.
- o Above figure is not fixed, it keeps varying as per the cost of raw material in the market.

3.14 COST OF PROCEDURES CHARGED IN CATH LAB

Procedure	Cost in Rs
CAG	10,000
PTCA	50,000
PPI	25,000

Note:

- All procedures are carried out with Non-Ionic dye.
- The above cost does not include any cost of any sort of implant if used.
- The above cost is inclusive of all routine investigations, CCU charges, normal medication, procedure cost, staff fees, and food e.t.c.
- The above cost does not include the cost of special medicines as they vary from patient to patient.

3.15 ACTUAL EXPENDITURE ON CAG PROCEDURE IN CATH LAB

a. 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

b. 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

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

d. Comparison of actual versus charged cost in the package for CAG

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

3.16 ACTUAL EXPENDITURE ON PTCA PROCEDURE IN CATH LAB

a. 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

b. Calculation for overhead cost per procedure

Head	Cost (Rs)
Electricity cost	1015
Equipment cost	1330
Depreciation charges of building	116
Cath lab maintenance charges	168
Charges due to inventory	11
Total	2629

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

d. Comparison of actual versus charged cost in the package for PTCA

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

3.17 ACTUAL EXPENDITURE ON PPI PROCEDURE IN CATH LAB

a. 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

b. 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

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

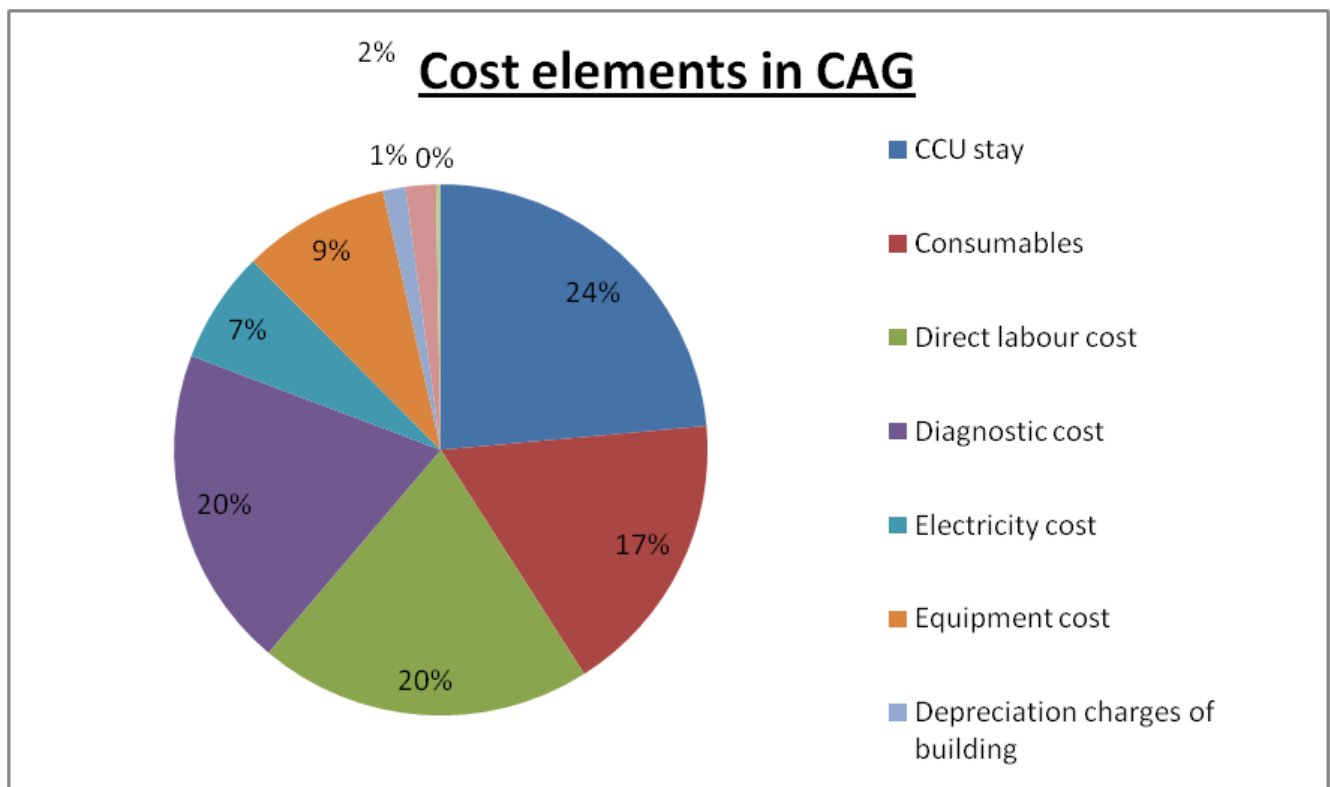
d. Comparison of actual versus charged cost in the package for PPI

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

3.18 INFERENCE

a. CAG package

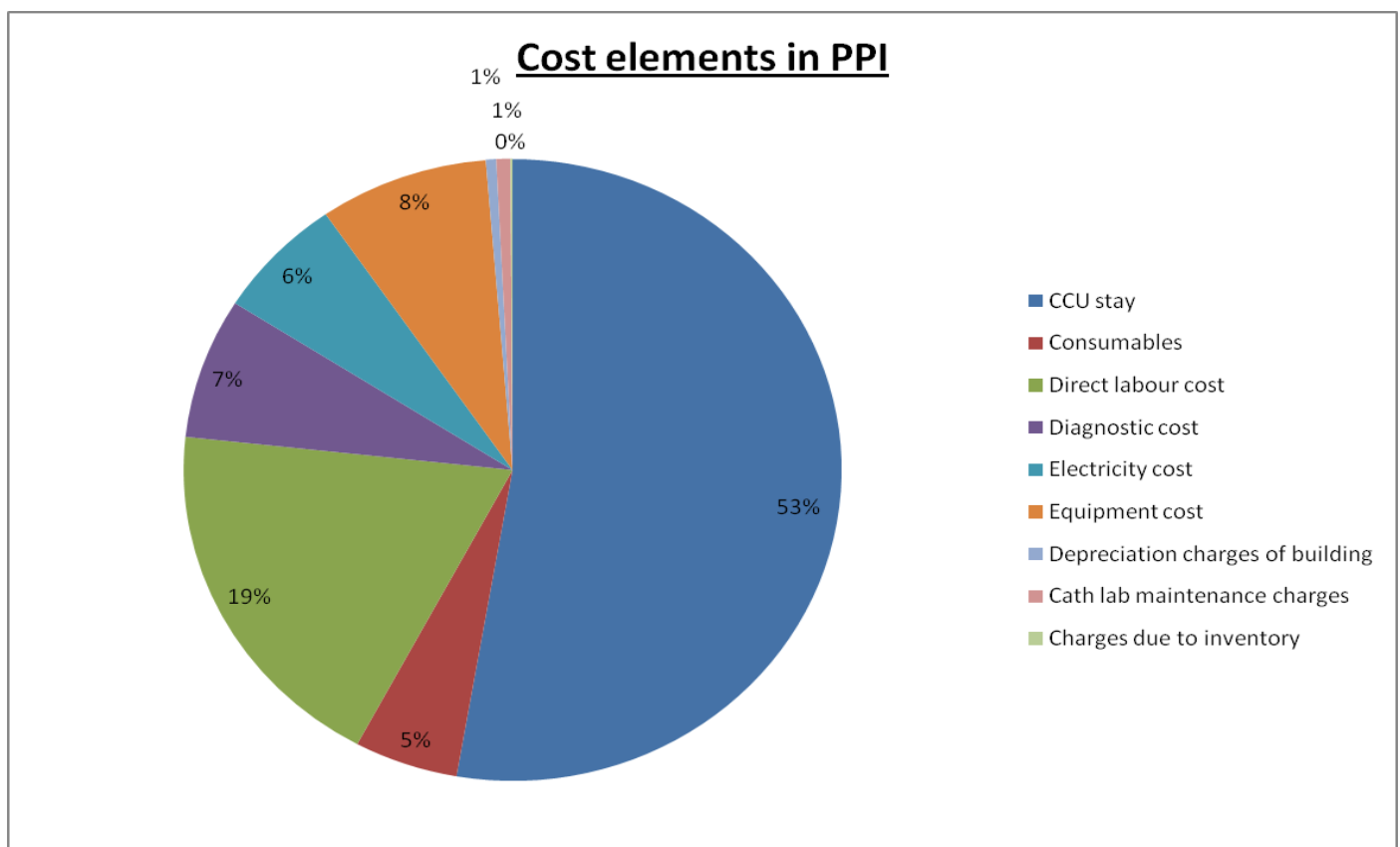
- CAG procedures are about **63%** of total procedures done in Cath Lab in 2013
- Cost of CAG package is just adequate with a buffer amount of **Rs 1506**. This buffer amount can easily cater for any fluctuation in external market and keep package price unchanged and self sustained.
- Hospital is not 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)

b. PPI package

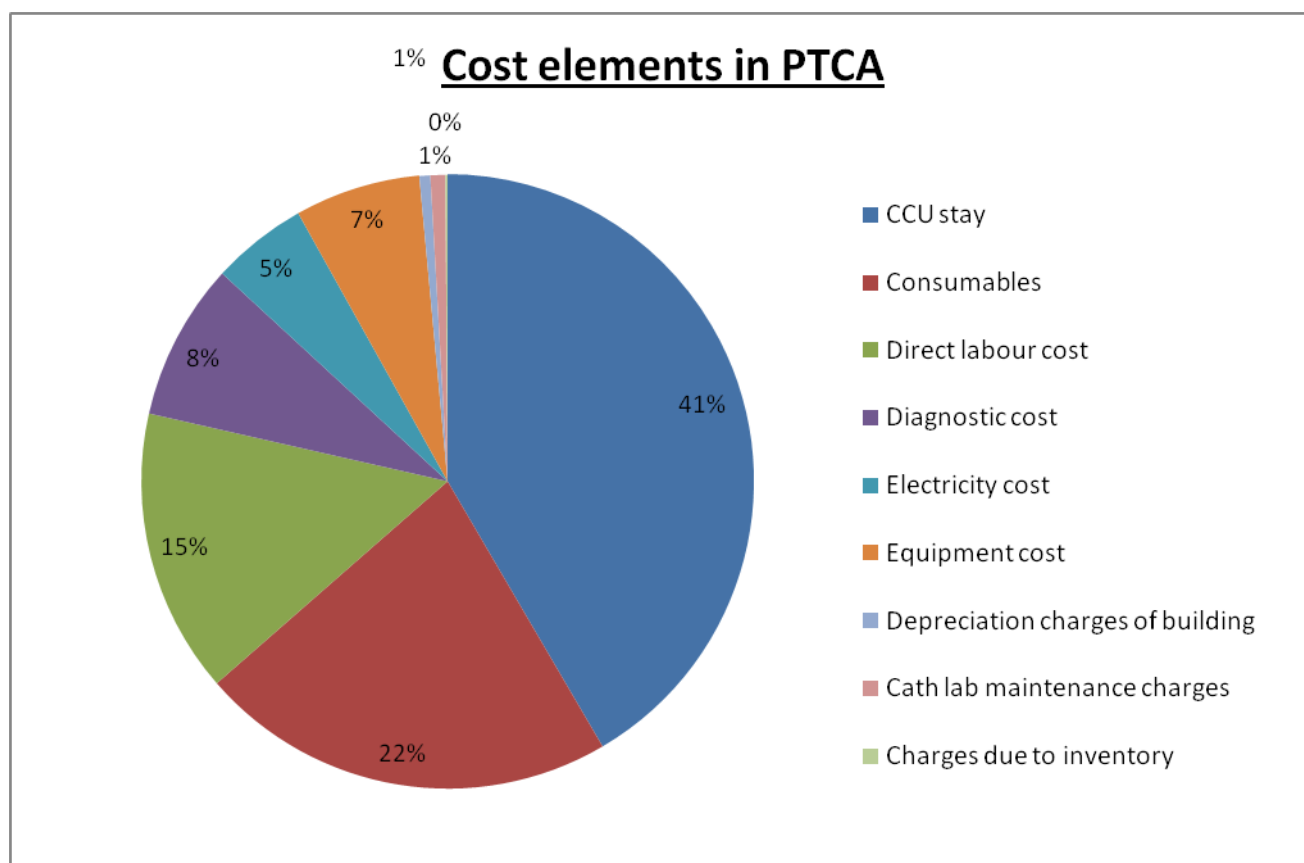
- PPI procedures are about **2.8%** of total procedures done in Cath Lab in 2013
- Cost of PPI package is just adequate with a buffer amount of **Rs 2212**. This buffer amount can easily cater for any fluctuation of external market and keep package price same and self sustained.
- Hospital is not making 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)

c. 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)

d. 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

4 RECOMMENDATIONS

a. To Increase the revenue

- To increase the revenue of hospital it is recommended to go for **Bundle package** system rather than individual packages. For example bundle package of CAG & PPI with reduced amount of Rs 30.000 (less than total of each package separately).
- Increase the number of procedures done in Cath Lab in a year. For this focused and effective **Marketing strategies** to be evolved and implemented.

b. To decrease the cost of the procedure and overall package to hospital

- Reduction in stay of patients in CCU both- pre-operative and post operative by having a separate **Catheterization Ward**. Stay in this ward is much cheaper and meets all medical requirements of patients. Moreover running cost of such ward is equivalent to a normal ward
- Continuous **Quality Improvement** (both Pre and Post procedure) and effective **Team Management**.
- Effective labour cost per procedure to be reduced by increasing the number of procedures done in Cath Lab in a year.
- 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 E.T.O sterilization.

5 LIMITATIONS AND ISSUES OF SUCH PACKAGE SYSTEM OF PAYMENT

- 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 varies 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.

6. CONCLUSION

a. CAG package

- CAG procedures are about **63%** of total procedures with a buffer amount of **Rs 1506**.
- Hospital is not making any noticeable profit from CAG package (**17% only**). Total revenue generated in 2013 from this is **Rs 965346**.
- 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)

b. PPI package

- CAG procedures are about **29.5%** of total procedures with a buffer amount of **Rs 2212**.
- Hospital is not making any noticeable profit from PPI package (**9.7% only**). Total revenue generated in 2013 from this procedure is **Rs 712264**.
- 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)

c. PTCA package

- PTCA packages are about 33% of total procedures and is generating a fair amount of margin per procedure (about 240%). It's the major revenue generator procedure 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)

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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8. ANNEXURE

8.1 LIST OF CONTENTS IN ANNEXURE SECTION

Serial no.	Description	Page no.
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8.2 BRIEF OF HOSPITAL

a.Introduction

Soni Manipal Hospital is first hospital in the group which started in 1986 as a 20 bedded Nursing Home and by 1996 it had expanded to Rajasthan's first 100 bedded corporate hospital. This state of the art multi-specialty hospital now also provides super-specialty services such as Cardiology, CTVS, Oncology (Cancer), General and Advanced Laparoscopic Surgery, Critical Care and numerous others specialties.

Founded by eminent **Dr.B.R.Soni**, the institutions have been envisioned with the aim of bringing to Jaipur the highest standards of medical care along with clinical research, education and training.

Soni Group is governed under the guiding principles of providing medical services to patients with care, compassion, commitment. Since its inception in 1986, the Soni Group has been the pioneer that has completely re-defined the healthcare scenario of Rajasthan.

Soni Manipal Hospital Constructed in a small span of 15 months and operational from Oct 2004, this hospital is now one the top class healthcare institutes in northern India. Spread across, extensively over **an area of 2,55,000sq. ft., Soni Manipal Hospital** is the first of its kind in private sector to be approved by the state government for medico legal Services. It is also the largest Hospital in Rajasthan accredited with both **NABH & NABL**. The institute includes a research center, nursing college, nursing school and some minor medical school diploma courses. It has 315 beds with proposed capacity of 600 beds and over 120 critical care beds with 09 operation theatres catering to over 20 specialties Soni Manipal Hospital houses six centers of excellence which will provide medical intelligentsia, cutting-edge technology and state-of-the-art infrastructure with a well-integrated and comprehensive information system.

Soni Manipal Hospital is the first private hospital in Jaipur to handle Trauma and Medico-legal cases related to accidents and injuries. This state of the art hospital is equipped with all modern world class equipments and facilities. Featuring multi-specialty and super-specialty departments, we provide premier healthcare to all. A Team of 60 renowned consultants headed by 5 ex-principals & HOD's of medical Colleges are affiliated to serve patients and their respective needs. Soni MANIPAL Hospital provides treatment in over 60 different specialties including Cardiology, CTVS; Oncology (Cancer); General and Advanced Laparoscopic Surgery; Critical Care; Neurosciences; Orthopedics, Polytrauma, Joint Replacement and Sports Medicine; Gastrosiences and numerous others specialties.

b. Location

Located in Jaipur, situated in Sector 5, Main Sikar Road, Vidhyadhar Nagar immensity of size immediately distinguishes it from rest of the surrounding.

c. Philosophy

The Hospitals philosophy is " **Kaare Zindagi Ki Baat ... Hamare Saath**" or " **Your Life ... We Care**"

Mission

We aim to provide world class healthcare at affordable rates to all members of the public.

d. Vision

To provide Quality health services with technological perfection and personal care under one roof with highly well equipped infrastructure by competent and devoted professionals at affordable cost that is inexpensive and accessible to everyone in an ethical and hygienic environment.

e. Achievements

Outdoor Patients	over 2,50,000 patients.
Indoor Patients	over 40,000 patients.
Free Patients	over 50,000 patients.
Pathology Diagnostics	over 800,000 tests.
Radiology Diagnostics	over 100,000 studies done.
Blood Bank	over 25,000 Blood units processed.
Cardiology	Over 10,000 Angiographies Over 2,000 Angioplasties Over 2,000 Heart Bypass surgeries, Over 10,000 non-invasive procedures.
Urology	Over 15,000 dialysis patients served Over 750 procedures
Oncology	Over 10,000 cancer patients treated Over 15,000 radiotherapy cases Over 2,000 cancer surgeries. Over 1,000 cancer patients have been treated free of charge including drugs in the institute
Gastrosciences	over 10,000 invasive procedures

ICU cases	Over 100,000 ICU bed days of ICU services have been provided
Average Length of Stay	Very short and overall stay on an average about 4.15 days per admission
Longest Stay	Shri Vineet Malpani stayed with us for over 240 days (he is alive today)
No. of CT Scans Done in a single day on one machine	239 scans in 24hrs for 220 patients on a single CT Scan

f. Milestones Achieved by SONI hospital

- ➡ Leaders in ICU Care: We have the highest Critical care Standards and maximum number of ICU beds with lowest infection rates
- ➡ Leaders in Cardiology & Cardiac Surgery: We are the only center in the state which performs Roto-Blator technique
- ➡ Leaders in Neurosciences: With Dr. S. R. Dharkar at our helm, we have the best Neurosurgery unit with 1st Modular Neuro Suite
- ➡ Leaders in Oncology: With our existing infra-structure, daycare ward and Primus Dual Energy Linear Accelerator & HDR Brachytherapy, we have most advanced cancer center in the state
- ➡ Leaders in Nephrology: We are doing over 400 dialysis cases a month and have advanced techniques such as CRRT
- ➡ Leaders in Joint Replacement: We have performed the maximum number of Joint replacement surgeries in the state. We did the 1st ACL, the 1st bi-lateral joint replacement & the 1st THR+TKR.
- ➡ Amongst top in Gastroenterology and GI Surgery: We are doing most procedures laproscopically including advanced bariatric surgery for obese patients.
- ➡ Experts in Trauma: We are regularly admitting Trauma cases and have a Trauma-care team also.
- ➡ Leaders in Radio Imaging: with the 1st CT Scan and 1st MRI in Rajasthan in 1992 and 1993, not to mention the 1st digital MRI in India in 2012 and a world record number of cases being done daily in SMS medical college. Soni group is the clear leader in Imaging in Rajasthan

8.3 INTRODUCTION TO CATH LAB

a. CATH LAB

The department deals with services which can be both diagnostic for detection of the diseases and therapeutic, on the basis of diagnostic findings. It covers mainly

- Coronary angiography (radial , femoral package's)
- Intra aortic balloon pump(IABP)
- Temporary pacemaker
- Cardiac Catheterization
- Pericardial tapping
- Aortogram
- Combo coronary angiography
- Coronary angioplasty
- Balloon angioplasty
- Permanent pacemaker
- Valvuloplasty

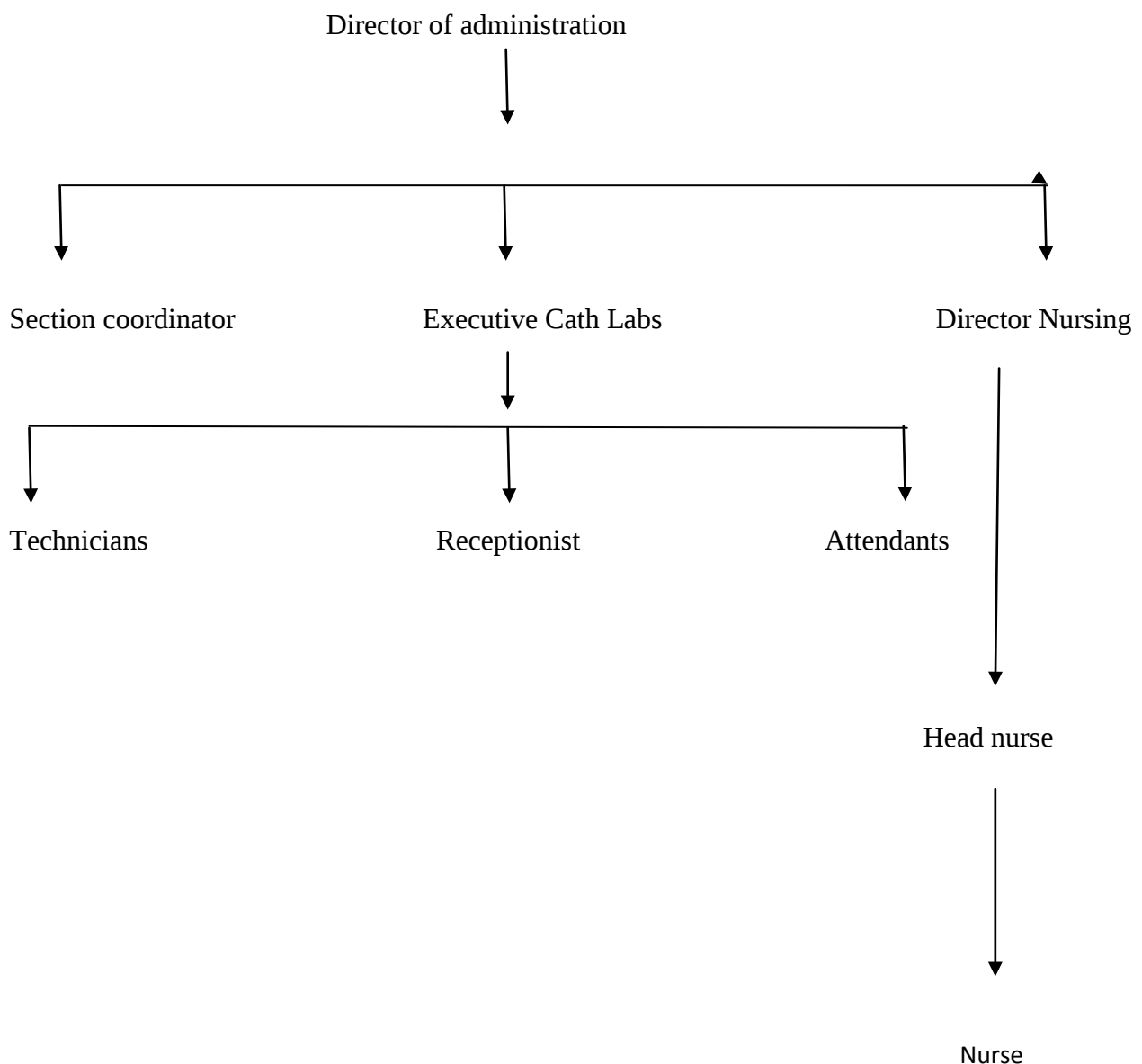
b. Staff

Executive administrator	1
Nurses	2
Technicians	3
Receptionists	2
Hospital attendants	2

Patient flow process: -.

- There are patients coming from SSS, IPD.
- Patients are appointed only after taking a detailed history (in person) and analyzing the condition or status of the patient.
- informing relatives about various packages available.
- According to the appointments the patient is taken in, all the necessary preparation is done, with the team of cardiac surgeon, consultant, nurses, attendants, technicians.
- A separate charge sheet is prepared for each patient that records all things consumed during the surgery or procedure.

- After the procedure, the patient is kept under observation depending upon the approach and case.
- Reports for all day care procedures are given the same day and that for angioplasty, given before discharge
- Cath lab offers different femoral and radial packages for angiography. Cath Lab maintains proximity with intensive care unit.
- ***Organogram for the Cath Lab***



8.4 TOTAL NUMBER OF PROCEDURES IN CATH LAB IN 2013

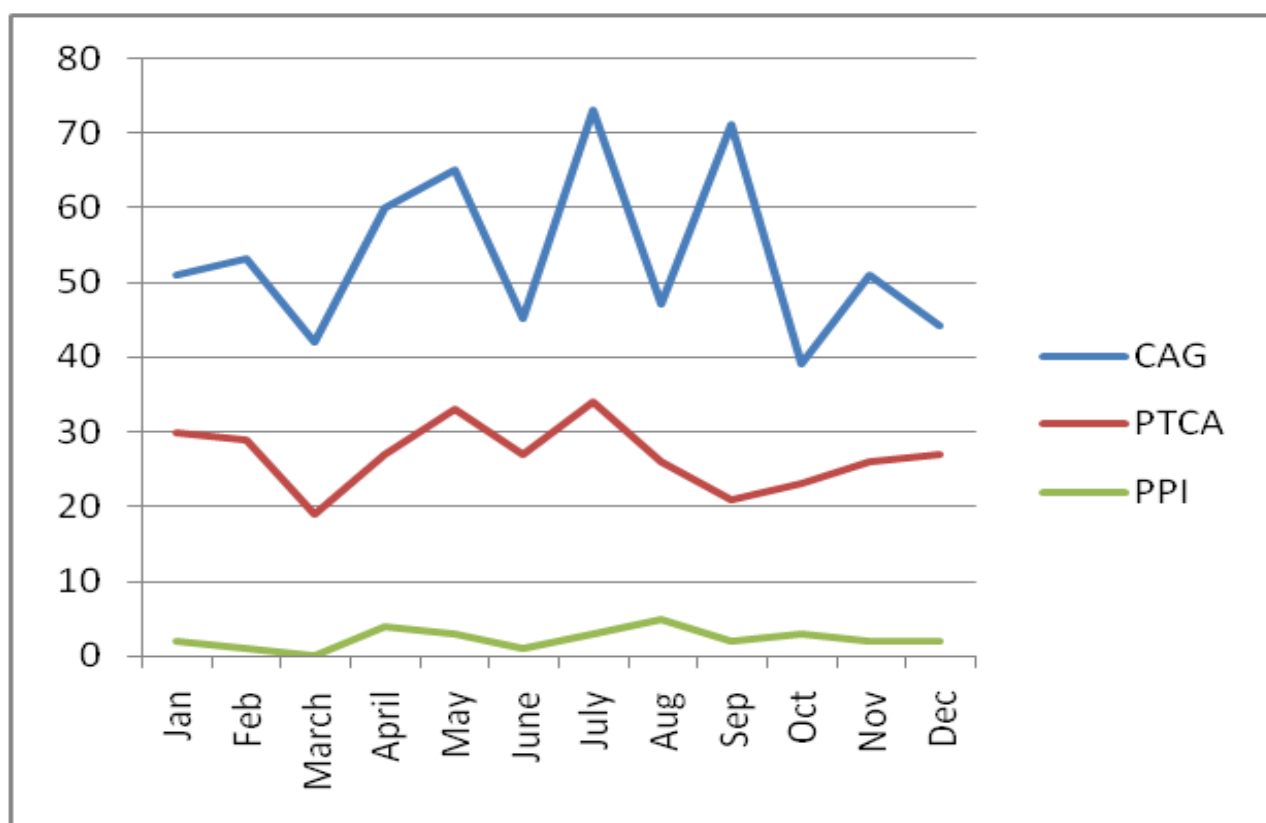
Procedure	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Total
CAG	51	53	42	60	65	45	73	47	71	39	51	44	641
PTCA	30	29	19	27	33	27	34	26	21	23	26	27	322
BMV	1	3	3	4	1	1	6	2	2	0	1	2	26
Embolization	0	0	0	1	0	1	1	0	1	0	1	1	6
PPI	2	1	0	4	3	1	3	5	2	3	2	2	28
TPI	4	2	2	3	1	2	1	3	1	3	2	1	25
EP Study	2	0	0	0	2	1	1	0	0	0	0	0	6
CATH STUDY	0	0	1	1	0	1	1	0	0	0	1	1	6
RFA	2	0	0	0	2	1	1	0	1	0	0	0	7
PTA	2	1	0	1	0	1	0	0	0	0	0	0	5
PTRA	0	0	0	1	1	1	0	0	0	1	0	1	5
IABP	1	0	0	1	0	0	0	1	0	1	1	2	7
PAG	0	1	0	0	1	0	0	0	0	0	0	1	3
DSA	1	0	2	2	3	0	0	0	2	0	0	0	10
CRTP	0	0	0	1	0	0	0	0	2	0	1	0	4
Total	96	90	69	106	112	82	121	84	103	70	86	82	1101

8.5 CASE MIX OF CATH LAB of 2013

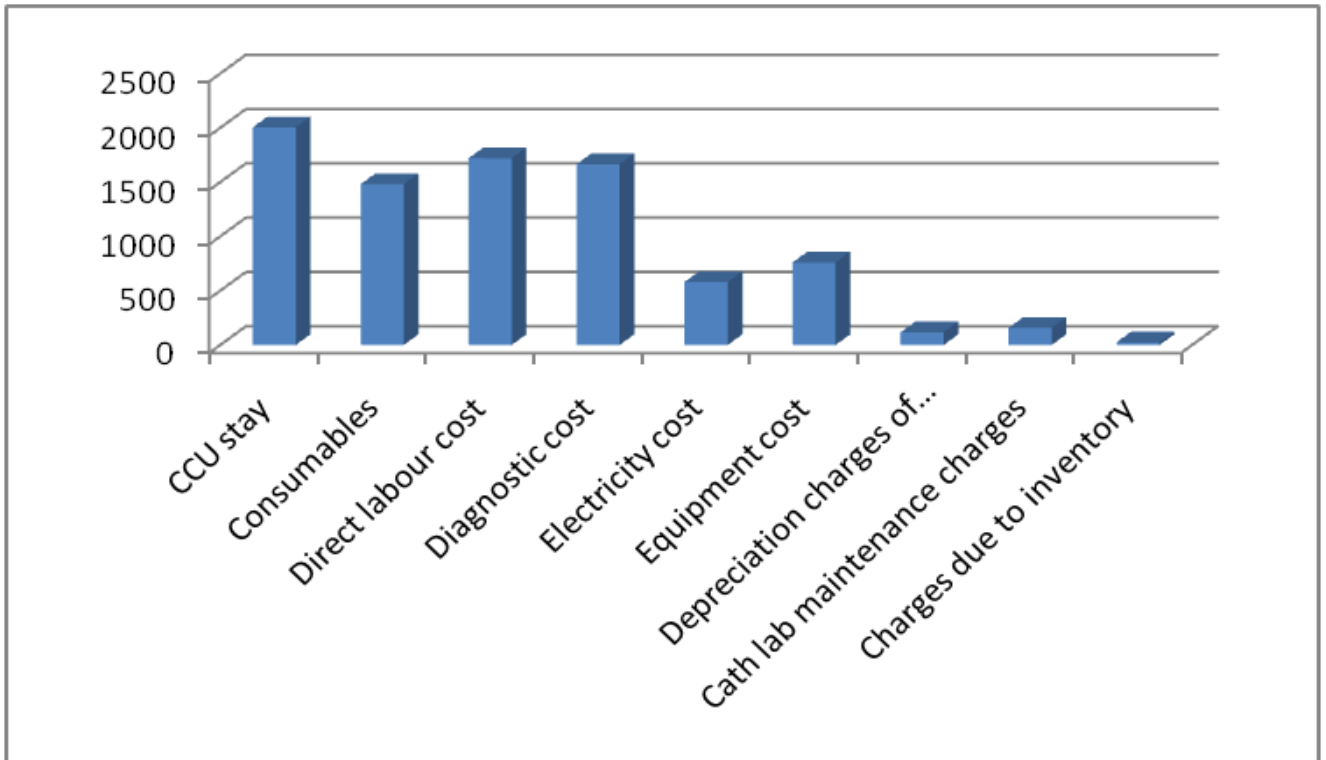
Procedure	Total	% of total cases
CAG	641	58.2
PTCA	322	29.2
BMV	26	2.3
Embolization	6	0.5
PPI	28	2.54
TPI	25	2.3
EP Study	6	0.5
CATH STUDY	6	0.5
RFA	7	0.6
PTA	5	0.5
PTRA	5	0.5
IABP	7	0.6
PAG	3	0.3
DSA	10	0.9
CRTP	4	0.4
Total	1101	100.0

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

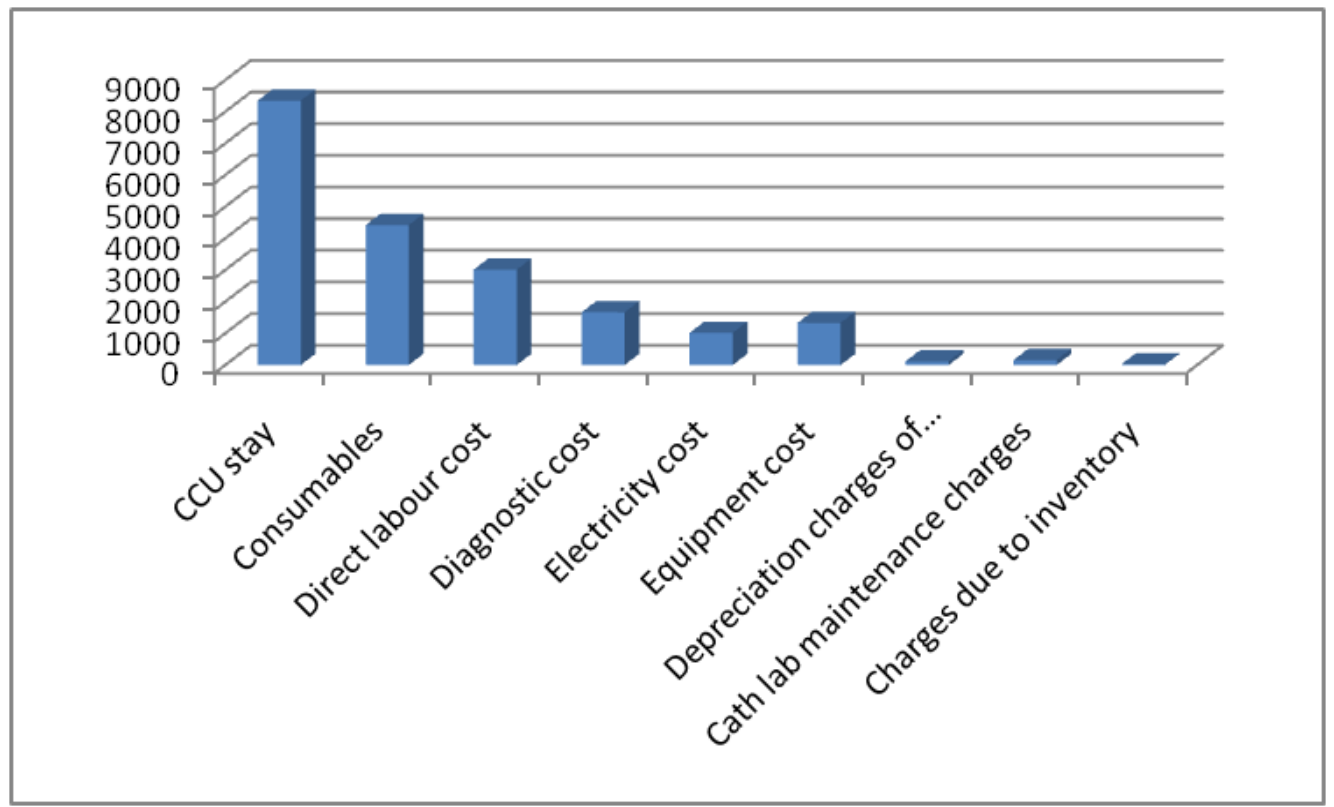
Procedure	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Total
CAG	51	53	42	60	65	45	73	47	71	39	51	44	641
PTCA	30	29	19	27	33	27	34	26	21	23	26	27	322
PPI	2	1	0	4	3	1	3	5	2	3	2	2	28



8.7 BREAKDOWN OF VARIOUS COST ELEMENTS IN CAG PROCEDURE



8.8 BREAKDOWN OF VARIOUS COST ELEMENTS IN PTCA PROCEDURE



8.9 BREAKDOWN OF VARIOUS COST ELEMENTS IN PPI PROCEDURE

