



COST ANALYSIS OF FOUR VESSEL ANGIOGRAPHY

Dr Shruti Samyal	MD (Hospital Administration), Military Hospital Shimla.
Dr Ashutosh Sharma*	MD (Hospital Administration), Command Hospital Air Force Bangalore. *Corresponding Author
Dr Girish Deshmukh	MD (Hospital Administration), Military Hospital Yol.

ABSTRACT

With the increase in number of cerebrovascular diseases in society there has been an increase in demand for cerebral angiography, which is often critical in the management. More facilities undertaking the investigation modality are being established and the test often forms a part of such patient's bill. Hence it is essential to know the costs which are associated with the procedure. Installation of such facility is not just a one-time expenditure but requires continuous expenses/ running costs. It is one of the most commonly done test at an Interventional Radiology Centre. Hence this study was undertaken to assess the cost incurred in conduct of a Four Vessel Angiography at a tertiary care teaching hospital.

KEYWORDS : Cost Analysis, Four Vessel Angiography, Running Cost, Overheads, Cost Blocks

INTRODUCTION

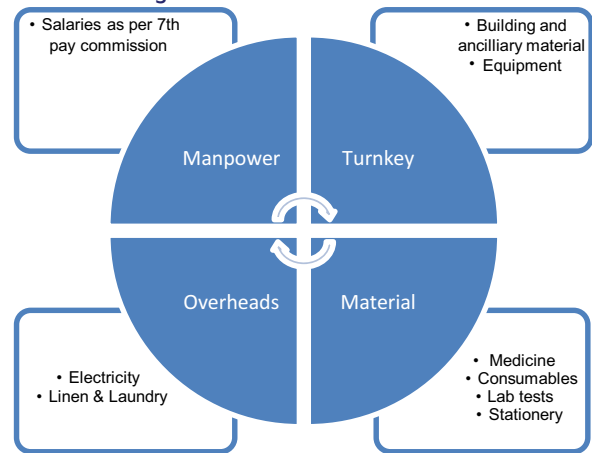
Four Vessels Angiography is a diagnostic procedure that uses x-rays to take pictures of cerebral blood vessels. This test is used to diagnose cerebro-vascular diseases like stroke, aneurysms, arterio- venous malformations, tumors, clots, and arterial stenosis, where non-invasive imaging is inconclusive. (1, 2).

The test is increasing in demand as the burden for cerebrovascular diseases is increasing globally, responsible for 5.4 million deaths every year (1 in 10 of total). For India, some reports indicate the incidence to be 13 to 33 per 100,000 population per year. In Western countries the incidence of CVD is reported to be 500 to 800 per 100,000 population per year(3, 4).

The cost associated with Cerebrovascular diseases was about UK £7-8 billion in 2005 and US \$62.7 billion in 2007. The anticipated cost of cerebrovascular diseases from 2005 to 2050 to the US economy is estimated at US \$2.2 trillion (3). This highlights the importance of cerebral angiography in modern healthcare and the likely increase in number of facilities conducting the test to meet the global demand.

To ascertain the unit cost of this diagnostic procedure, Process Costing Technique is adopted, which includes cost heads/ cost blocks as shown in table given below (5-8).

Table 1: Costing Heads



CASE STUDY

It was an observational and descriptive study conducted over a period of one month, at an Interventional Radiology Centre of a tertiary care teaching hospital in Pune.

Initially process flow mapping of activities related to one Interventional Radiology procedure were carried out along with direct observation of the physical facilities and layout of the center, staffing pattern and materials used in the procedure. In addition to document review to study the workload, unstructured staff interviews were conducted to understand the details of procedures. To ascertain cost to each activity related to the process, stepwise approach to the procedure is studied as shown below:

Table 2: Process Mapping of Four Vessel Angiography Procedure

(A) Area wise flow of patient				
S. No	Reception	Gowning Area	IR Room	Recovery Area
1	Patient reports	Gowning	Patient is put on monitoring	Patient is monitored for 20 minutes
2	Documents are checked	-	Local anesthesia and heparin is injected	Removal of Sheath
3	Investigations are checked	-	Puncture of artery with needle	Application of pressure bandage
4	-	-	Short guide wire is introduced	-
5	-	-	Sheath is put	-
6	-	-	Insertion of guidewire	-
7	-	-	Diagnostic catheter is inserted	-
8	-	-	Dye is injected	-
9	-	-	Images are recorded	-
10	-	-	Diagnostic catheter is removed	-
(B) Time Taken : 100 (In min) 1.5 hr				
	05 min	05 min	60 min	30 min

Computation of the cost of procedure has been done under Labour Costs, cost of consumables and medicines, equipment, equipment maintenance, building, air-conditioning & electricity, linen and laundry as well as cost of stationery. Thereafter cost was apportioned to the unit procedure to arrive at the cost of unit package cost for the Interventional Radiology procedure.

Manpower Cost: Salary of staff was taken as per 7th Central Pay Commission and leave period of the staff was not considered. Cost was apportioned to the salary per hour considering 176 working hours in month.

Cost of Building: Assuming that the useful life of the building is 50 yrs and residual value of the building is zero, the annual expense use Straight-Line Depreciation Method is calculated as:-

$$\text{Annual dep. expense} = \frac{\text{cost of fixed asset} - \text{residual value}}{\text{Useful life of asset (years)}}$$

Building Maintenance Cost: Cost of maintenance per hour : Cost of Annual Maintenance Contract (AMC) / No. of hours

Cost of Equipment: The useful life of the equipment is assumed between 7 to 10 yrs. Straight-line Depreciation Method is used. Cost of maintenance is concluded from AMC.

Cost of Material: The unit cost of all the drugs and consumables used for the patient care during the procedure is taken as the Last Procurement Price (LPP). Cost of Lab tests are as per CGHS rate list.

Cost of Overheads: Cost of Air Conditioning and Electricity Consumption of Equipment is calculated as per local electricity board rates. Cost per 1.5 hours is calculated.

RESULT

Cost break up per patient per procedure is shown in Table 3,

Table 3. Final Cost

S. No	Cost Element	Cost Per Patient Per Procedure
1	Manpower	3587.98
2	Consumables	4159.02
3	Electricity	2666.42
4	Repair & Maintenance (Building & Equipment)	486.11
5	Depreciation on Building	43.77
6	Depreciation on Equipment	555.17
7	Linen and Laundry	156.00
8	Administrative and Stationary cost	46.94
9	Lab tests	592.00
Total		12,293.41

It was observed that per patient cost of materials (consumables) associated with procedure is maximum followed by overheads cost as shown in the figure below:

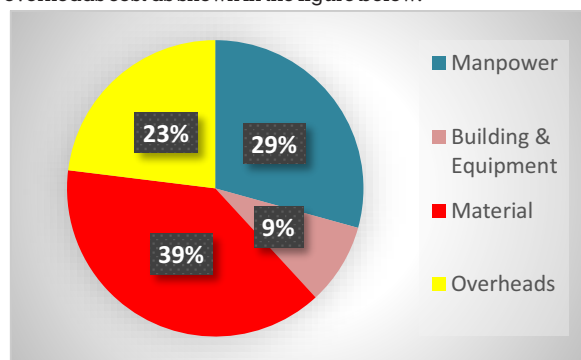


Figure 1: Percentage of cost as per cost heads

Upon comparison with rates of other hospital, there was a wide range of variations in cost of the procedure from CGHS rates of 2014 (9). However, there is not much variation from rates of Yeshasvini scheme of Karnataka (10) when cost of consumables and lab investigations are included.

CONCLUSION

The unit cost of the procedure incurred by the organization is Rs 12,295.00 approx. which includes cost of manpower, material, machine, building, electricity etc. Maximum cost involved in the overall costing is cost of Materials, especially consumables.

Upon comparison of cost with other hospitals, it was found that the rates are almost similar to that of other government hospitals and lesser than rates of CGHS.

It is recommended that due to high running cost involved in providing the facility for Four vessel angiography procedure, for private setup planning should be done at regional level where number of patients will be more and economy of scales can be applied during procurement of consumables. For government organizations, where return on investment and running cost is not an issue, allocation of fund/ resources can be need based.

REFERENCES

- [1] Shetty PG, Jhaveri K S. Neurovascular applications of CT angiography. Indian J Radiol Imaging [serial online] 2000 [cited 2019 Jun 7];10:211-20. Available from: <http://www.ijri.org/text.asp?2000/10/4/211/30565>
- [2] Ahn SH, Prince, E. A., & Dubel, G. J. (2013). Basic neuroangiography: review of technique and perioperative patient care. Seminars in interventional radiology, 30(3), 225-33.
- [3] Flynn RW MR, Doney AS. The cost of cerebral ischaemia. Neuropharmacology. 2008 Sep 1;55(3):250-6.
- [4] Banerjee A. K. (2017). CEREBROVASCULAR DISEASES IN INDIA - A PATHOLOGISTS VIEWPOINT. Medical journal AFI, 52(2), 116-119.
- [5] Wong JH, Mitha AP, Willson M, Hudon ME, Sevcik RJ, Frayne R. Assessment of brain aneurysms by using high-resolution magnetic resonance angiography after endovascular coil delivery. Journal of neurosurgery. 2007 Aug 1;107(2):283-9.
- [6] Helsper R, Cesari JJ. Developing radiology procedure cost standards. Radiology management. 1997;19(4):41-8.
- [7] Karlik SJ RR. The cost of angiography procedures: OHIP gets a bargain. Canadian Association of Radiologists Journal. 2002 Dec 1;53(5):284.
- [8] Walther; LM, Skousen CJ. Managerial and Cost Accounting [Internet]. 2009 [cited 2019 Feb 9]. Available from: www.london.edu/mim/
- [9] CGHS rate list for Mumbai hospitals (internet). available at <http://www.cghsmbai.gov.in/htmldocs/Rate%20list.pdf>, last accessed on 1 March 2019.
- [10] SHICSR Procedure Charges (internet) available at http://www.jayadevacardiology.com/procedure_charges.html, accessed on 01 March 2019.