

Costing Accounting Techniques as a Tool for the Development of Hospital Administration: A Case Study

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This paper aims to implement a scientific and accurate technique of cost accounting in order to compute the cost of medical tests in the departments of hospitality and treatment in hospitals by using a processing costing system as well as a relative value units (RVUs) method for measuring unit costs of various medical services performed within different departments of the hospital. The related proposed model that was applied in the Department of Laboratory at Max Super Specialty Hospital (MSSH), West Block, Saket, New Delhi in November 2013, has been selected for application in this study. Information has been collected from registers, purchase orders, payroll, accounting books, hospital bills, and interviews with hospital staff. The study concludes that the hospitalisation's cost for patients is assessed via the total of the RVUs of services for patients within every department. The resulting total is then multiplied by the department cost for each RVU. After this, the sum of the resulting cost total for entire departments where patients obtained a certain service is calculated. The study explains the role of the cost accounting system as a tool for developing hospital administrations, and states that it can be employed as a guideline for all hospital administrations, for analysing department costs, pricing decisions, budgeting, and determining care quality. As such, the success of applying the proposed methodology in the department of the laboratory of MSSH yields the success of its application in other departments of the hospital.

Key words: *Costing Accounting Techniques, Hospitality and Treatments cost, Relative Value Units (RVUs), Process Costing System.*

Introduction

Accounting represents an essential part of health care management, in general and hospital administrations, in particular. Most health care institutions have increasingly focused on cost control measurements. Managers, not only accountants, have become more conscious of the significance of understanding anything regarding costs. The increasing costs of health care is a matter of concern all over the globe, especially because the vast majority of countries have limited resources. It is therefore necessary that the utmost value is secured from these limited resources. Therefore, improvements in methods and increases in efficiency are a must for contemporary hospital administrations. With a view to securing maximum productivity, it is necessary to establish modern accounting techniques. Hospitalisation costing data is determined by relating the contributions of assets in money related terms to the yields of administrations provided by hospitals. Costing data provides fundamental figures required by directors and strategy makers to make decisions regarding how to enhance hospital performance, where to assign the assets inside or among hospitals, or to analyse the performing of various hospitals. The purpose of this data is to enhance proficiency, viability, quality and upgrade sustainability.

Literature Review

Young and O'Brien (1991) stated that the earliest example reported of activity-based costing in a healthcare setting shows how an average patient day cost rate in a specialist hospital could be refined by revising the costing system to reflect the different activities which were associated with patient care. King et al. (1994) illustrated that there are a number of studies relating to the application of the activity-based costing concept to healthcare in North America and the UK which have been published in recent years. Innes and Mitchell (1997) studied activity-based costing in the banking industry and introduced this technique as the one that met managers' information needs and helped them to have a clearer understanding of costs of services. Fitzgerald and Dufour's (1997) study, which is one of the comparative studies, compared management practices between Canadian and UK hospitals.

Furthermore, Hill (2000) offered a historical perspective on the adoption of cost accounting systems in the U.S. hospital sector; he adopted a rationalistic perspective that explains the utilisation of cost information as related to the hospital finances. Northcott and Llewellyn (2002) found a significant variation in the calculation methods of cost information that was reported by UK hospitals, regardless of the fact that the costing methods were supposed to be standardised. Lievens et al. (2003) used activity-based costing techniques for cost calculations in radiotherapy. After applying this system, the management of this centre introduced a strong method for setting the final prices of services. Additionally, in research conducted by Barton & Macarthur (2003) regarding activity-based costing and predatory pricing, it was realised that

an approach that improves costing in gasoline dispensing retail facilities helps to correct the problem of product-cost subsidisation. Nyland and Pettersen (2004) found that the role of physicians is vital in linking hospital budgets with management practices in Norway. Kurunmäki (2004) also examined the use of accounting information by health care professionals. These studies explain accounting systems that exist in the health care accounting literature.

The study conducted by Odysseas and Loannis (2007) provided insights concerning Greek hotel industry practices in the field of cost accounting. To this end, a survey was conducted with 85 firms from the Greek hotel sector with the use of questionnaires. Results showed that hotel enterprises have a high fixed cost structure and also face a high proportion of indirect costs. According to the statistical analysis, factors that mostly affect the managerial decision of hotels in favour of an ABC system include their cost structure and the cost calculation per customers' categories. An investigation conducted by Bitar and Mohammad (2017) provided some empirical evidence about the implementation of activity-based costing in the hospitality industry in Iran. The study used ABC as a costing method and compared the cost of each service unit with the cost which had been extracted by the traditional costing method. The results showed a different cost per unit using the two methods. Due to its more precise and detailed information, an ABC system facilitates the decision-making process for managers regarding decisions related to profitability analysis, budgeting, pricing, and so on. Obaid et al. (2019) focused on diagnosing strategic management accounting techniques in order to keep pace with global developments and to pave the way for the promotion of local products and work to open up to global markets by presenting the main knowledge foundations of quality costs and all their classifications. In addition, the study explained the targeted cost technique and its impact on creating and enhancing the competitive advantages of upgrading local products in Iraqi hotels and hospitality sector businesses.

Le Anh et al. (2020) determined the influence of factors on the application of managerial accounting for hotel business enterprises in the city of Da Nang in Vietnam. The study showed that the following factors are arranged in a descending manner, in terms of the degree to which management accounting is used: legal provision, organisation structure, accounting staff, competitive pressure, firm size, and facilities. The study helped the city and hotel managers to develop appropriate policies for the application of management accounting in businesses. This study can be distinguished from the other studies mentioned above by the way that it shows the importance of costing accounting techniques as a tool for use in hospitals or hotels by utilising a processing costing system as well as the relative value units (RVUs) method as a contemporary cost system.

Costing Accounting in Hospitals

Costing health care services has become a major requirement due to technological advances and an increase in demand for health care services. Mackie (2006) has therefore said that hospital administrators need effective cost information for their decision-making in order to maintain cost control. Hancock (1986) has stated that much of what hospital administrations do can be considered either decision making or managerial control and both of them require that administrators be informed in order to perform effectively and efficiently. To be informed, administrators must obtain information from numerous reliable and related sources. In most organisations, the most common sources for management information are financial reporting systems and cost accounting systems. Hospital's administrations are facing tough pressure for developing clinical excellence, improving services, expanding access, and reducing costs. Competitive pressure in the marketplace needs health care systems to calculate monitoring. Performance system for maintaining and expanding market bases are also required. Cutright et al. (2000) and Thorley (1994) have declared that health care systems which can articulate as well as demonstrate the provided services' value have competitive advantages. Young (2008) stated that regardless of whether it acquires an enormous volume of new patients by offering charges below full cost, it is necessary to know the full costs. The drive to employ costing accounting is dependent upon making the correct choices regarding the determination of charges for health services and aims at (Al-Janabi and Mhaibes, 2019):

1. Obtaining data regarding unit and total costs for health servicing given to patients;
2. Determining the elements that affect costs levels and price structuring;
3. Enabling correct decisions to be made concerning the allocation of finance resources in hospitals, the implementation of different medicinal skills, the development of action strategies, etc;
4. Determining the result of costing centres along with the evaluation of their share in the total finance outcomes;
5. Controlling the costs acquired and the results of separate organisation units or action kinds;
6. Testing and evaluating the validity of utilising the assets that exist in hospitals to enhance the efficiency of their operations;
7. Providing economical education for the staff of hospitals.

Methodology

Historically, according to Garrison and Noreen (2000), there are double costing accounting systems, namely: 1) job order costing; and 2) process costing. These two systems have been utilised to cost the product along with the servicing and several firms continuously utilise such conventional costing systems.

Process Costing System

Within the current system, , the costing of products or services can be achieved via allocating a cost to masses of the same units, and at that time calculating unit costs on an average basis (Horngren, et al., 2000). A hospital process costing system begins with the accumulation of costs and procedures by the department responsible or by program accounting (general ledger accounts). The cost of the resources used to produce the services of the department are accumulated within the hospital's general ledger and are averaged over the department's total output. Any patient using the department's services is charged with one share of the unit costs for each unit of service received.

Implementation Procedures of Process Costing in Hospitals

In a process cost system, according to Kukal (1986), the management of the hospital should implement the following procedures:

- 1) The cost of all resources used in the patient care process during the accounting period is accumulated in hospital cost centres.
- 2) Direct labour, direct materials, and indirect costs are incurred throughout the process. Production is measured in terms of the number of equivalent units of production.
- 3) A cost per unit is found by dividing the total cost by the number of equivalent units.
- 4) The sum of the unit costs derived for the services rendered to each patient or to each medical specialty is the cost of the total patient product.

Relative Value Units (RVUS)

Relative value units (RVUs) represents a method that is employed via the hospitals in order to calculate the costing of intermediate products, for example, a laboratory test, and dialysis treatment (Hancock, 1986). RVUs may also be utilised in a process costing system for better and more accurate allocation of costs among certain services presented in all departments. Many hospital directors treat RVUs as the most precise method for costs that currently exist (Flayyih, Mohammed & Talab, 2019). Relative value units are derived by using the weighted 'value of time' method. An RVU worksheet is provided to facilitate the process. These steps for medic servicing in hospitals could also be utilised to any work action in which a relative value must be computed. The rate of costing to charges (RCC) represents another strategy for moving toward cost accounting, with or without the utilisation of RVUs (Hanover, 2014). RCC can be determined effectively as a basic proportion of cost/charge yet doesn't have the benefit of considering the multifaceted nature and asset utilisation that the RVU does. However, the two are regularly utilised together, with the RCC replacing the RVU in areas in which RVUs are not accessible. When utilised together, in a half and half model, both RVUs and RCCs have

weaknesses, particularly when administrations are working with huge, complex, multiplication, and different assistance line wellbeing frameworks. The RVU's issues are primarily to do with estimation and assurance. Allocating cost is a matter for the two RVUs and RCCs.

Steps for Implementation of RVUs in Hospitals

The methodology for computing RVUs, for laboratory tests and radiology procedures in hospitals consist of six steps. The goal is to define the RVUs for every test so as to allocate the department costing to suitable tests, and after that to derive the costing per test. In such tests, the relative value units can be derived through utilising the weighted 'value of time' technique, as follows:

Step 1: Determine the Most Common Test

This is done by developing a list of tests which are done within the department of laboratory, then filling in the column on the worksheet with the tests.

Step 2: Determine the Time per Test

To conduct a time investigation, determine the average time of each test by the department of laboratory. The time estimation must include the time spent to get each test ready.

Step 3: Determine Average Time per Test

Total the times of all tests and divide the numbers of tests.

Step 4: Determine the Relative Values per Test

This is done by multiplying step 2 by step 3.

Step 5: Determine the Weighted Average Cost per RVU

This is determined by multiplying the RVU per test (step 4) by tests performed during a particular period in order to obtain the adjusted number of tests performed.

Step 6: Determine the Weighted Average Cost per Test

Determine this using the following equation:

Total cost for department during a period	×××××
Adjusted number of tests performed	÷ ××××
Weighted average cost per test	×××××

Step 7: Determine the RVU cost per Period

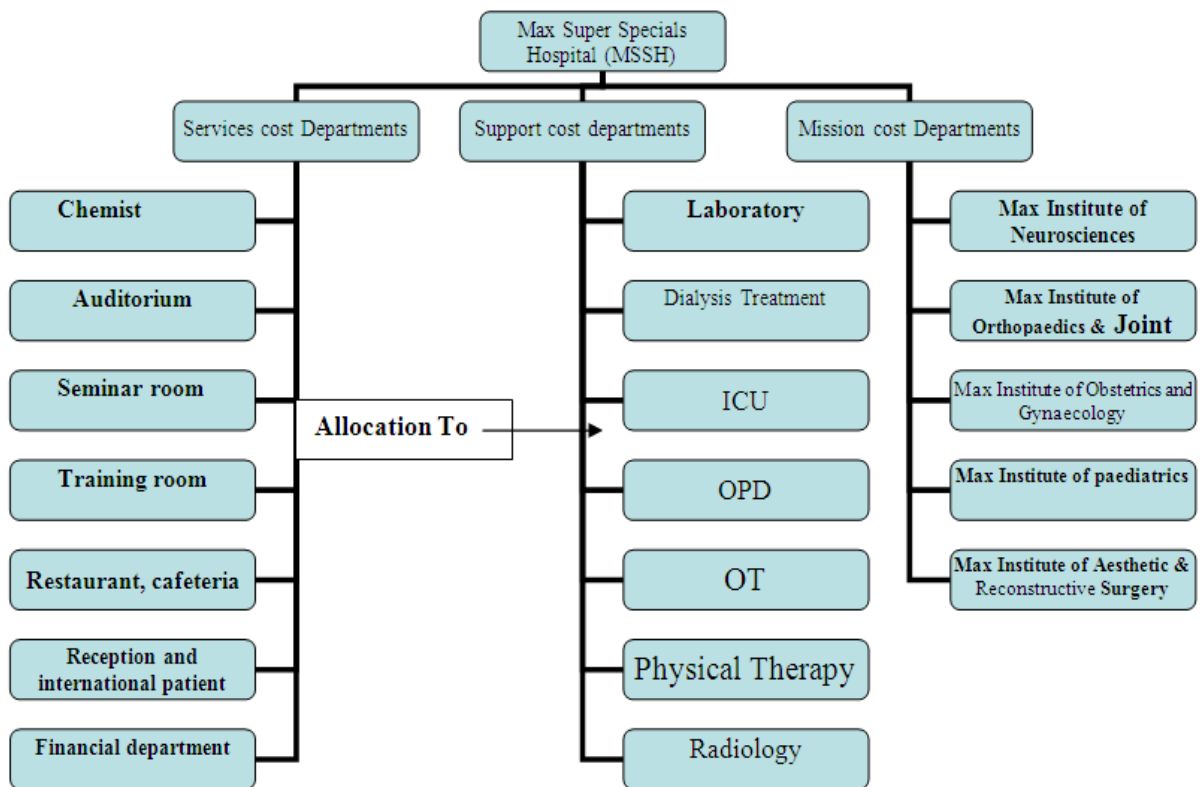
The cost of RVU for the period is found by the number of tests performed during the period, multiplied by the adjusted cost procedure of that period.

Max Super Specials Hospital (MSSH) – Case Study

Departmentalisation

Departmentalisation of the company (hospital) is to divide the company into sections known as departments, or cost centres where expenses are incurred. Departmentalisation serves two purposes: (1) closer control of overhead costs, and (2) more accurate costing of jobs and products (Lal and Srivastava, 2009). The model proposed for the application of our study of MSSH can be explained in diagram 1 below;

Diagram 1. The model proposed for MSSH



Results

During this step the direct and indirect costs in the laboratory department (November 2013) have been identified and analysed as follows:

Direct Costs

The direct costs in the laboratory department are:

- a) Consumable Materials Costs: Consumable medical materials in the laboratory department. Consumable material expenses consist of the costs of medical and common consumable materials which are utilised in the laboratory. This is calculated in Indian Rupees.
- b) Medical Materials: reagents, control materials, alcohol, vacutainer, microtainer, lancet, sodium hypochlrite, syringes, needles, calibrators, gloves, plaster, tubes, cotton balls, and anticoagulant containing tubes. The medical consumables costs are the direct materials which are utilised in blood analysis in the laboratory.
- c) Common Materials: Syringes, needles, tubes, slides. These are utilised in taking samples from the patient for examination.
- d) Salaries and Wages (In the laboratory department, this relates to professional costs involving lab testing and the salaries of staff (physicians and technicians) who analyse blood tests. There were 16 staff who worked in the laboratory, and the hospital is open 24 hours a day, seven days a week. Table 1 shows the monthly costs incurred in the department of laboratory.

Table 1: Monthly direct costs in the laboratory department

Direct costs	Monthly costs (Rs)
- Consumable Materials Costs are including:	
- Medical Materials Consumable	483200
- Common Materials Consumable	1000000
_Salaries and Wages	351500
Total	1834700

Source: Data tabulated by the researchers

Indirect Costs (Overheads)

Indirect costs, often called overheads, includes all costs other than direct materials and direct labour (salaries and wages). Elements of indirect cost include the expenses of departments and items that have traditionally been allocated to revenue-producing departments (mission cost departments) for cost-reporting purposes. Indirect costs in the laboratory are as described in Table 2.

Table 2: Monthly indirect costs in the laboratory department

Indirect costs	Monthly costs (Rs)
-Common services costs are:	
a- Depreciation costs are:	
- depreciation of direct medical equipment	30167
- depreciation of indirect medical equipment	5067
- depreciation of laboratory building	30166
b- Electricity costs are:	
- Equipment Medical (Coulter HNX, Coulter LH 750)	2910
-Central Air conditioning system (A/C)	2320
-Lights	1500
c- Water and Telephone	7790
d- Maintenance Costs	14250
e- Miscellaneous Costs	30500
Total	124670

Source: Data tabulated by the researchers

Finally, table 3 shows the total monthly costs of the summary of direct and indirect monthly costs in the laboratory department.

Table 3: Summary of direct and indirect of monthly costs in the laboratory

Cost Elements	Monthly Costs (Rs)
Direct costs	1834700
Indirect costs	124670
Total	1959370

Source: tables (1) and (2). Cost above.

Application of the Process Costing System in the Support Cost Departments in MSSH.

To understand the importance of RVUs, utilising the weighted 'value of time' technique, begin by analysing the problem in the department of dialysis treatment as follows:

Dialysis Treatment

The dialysis unit of MSSH had direct costs of Rs.1,571688 and allocated service centre costs of Rs.589,007, totalling costs of Rs. 2,160,695. During the year that it incurred these costs, it performed 5736 dialysis treatments. Question: What is the full cost of dialysis treatment? Which type of cost system do you utilise? **Answer:** since the department has a dialysis procedure as product, the costs are connected to a procedure merely via dividing the total costs



according to the number of procedures performed. As a result, the full cost of dialysis is Rs. 376. (See illustration 3). This is a **process costing system**, one in which every unit in the costing centre is comparatively identical.

Illustration

Total costs (direct and indirect costs) of dialysis treatment.....Rs.2160965.

Number of dialysis treatments performed during the year5736

Cost per dialysis treatment.....	Rs.376
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Department of Laboratory

At the current time, this is a more complicated department. The department of laboratory had 16 types of testing (CBP –ESR and Differential Leukocyte Counts). Some of the tests need more time than others, so there may be overheads that are driven by more complicated testing. In this case, an average per cost that is equals to all tests is used. Such procedures could be misleading and to overcome this problem, we used steps 1, 2, 3, 4,5,and 6 of the methodology used in this study, as follows:

Step 1. RVU Using Direct Labour Hours as Proxy

In this step we have used direct labour hours per tests to obtain the relative value per tests. The department of laboratory in MSSH is considered one of the most effective sections because it is considered fundamental in the diagnosis of many infectious blood diseases in the hospital. It provides CBP-ESR medical tests, as listed in Table 4.

Table 4: RVU Using Direct Labour Hours as Proxy

Medical tests	Direct Labour Hrs per test (1)	Avg Direct Labour per test (2)	Relative Value per Test (3) = (1) ÷ (2)
CBP – ESR:			
Hb%	0.50	0.625	0.80
HCT	0.30	0.625	0.48
RBC	0.30	0.625	0.48
MCV	0.30	0.625	0.48
MCH	0.60	0.625	0.96
MCHC	0.60	0.625	0.96
RDW	0.60	0.625	0.96
Platelet Count	1.10	0.625	1.76
WBC	1.00	0.625	1.60
Differential Leukocyte Count:			
Neutrophils	0.60	0.625	0.96
Lymphocytes	0.60	0.625	0.96
Monocytes	0.60	0.625	0.96
Eosinophil's	0.60	0.625	0.96
Basophils	0.60	0.625	0.96
Reticulocyte	0.70	0.625	1.12
ESR	1.00	0.625	1.60
Sum of times	10.00		
Numbers of tests	16		
Avg time per test	0.625		

Source: Data tabulated by the researchers

Step 2. Weighted Average Cost per RVU

In this step we have determined the weighted average cost per RVU (adjusted number of tests performed) in the department of laboratory by multiplying the RVU per test in tests performed during November 2013, as listed in Table 5.

Table 5: Weighted Average Cost per RVU

Medical tests	Tests performed (1)	Relative Value per Test (2)	Adjusted Number of Tests performed (3) = (1) ×(2)
CBP – ESR:			
Hb%	900	0.80	720
HCT	300	0.48	144
RBC	300	0.48	144
MCV	300	0.48	144
MCH	400	0.96	384
MCHC	400	0.96	384
RDW	400	0.96	384
Platelet Count	200	1.76	352
WBC	250	1.60	400
Differential Leukocyte Count:			
Neutrophils	400	0.96	384
Lymphocytes	400	0.96	384
Monocytes	400	0.96	384
Eosinophil's	400	0.96	384
Basophils	400	0.96	384
Reticulocyte	250	1.12	280
ESR	300	1.60	480
Total	6000		5736

Source: Data tabulated by the researchers

Step 3. Weighted Average Cost per Test

In this step we have determined the weighted average cost per test in the department of laboratory by dividing the total costs for the department of laboratory during November 2013, on an adjusted number of tests performed to obtain the weighted average cost per test as shown below:

Total costs for laboratory during period	Rs. 1,959,370
Adjusted number of tests performed	<u>5736</u>
Weighted average cost per test	<u>Rs. 341.591</u>

Steps 4, 5 and 6. RVU Cost Per Period

In this step we have determined the allocated costs in the department of laboratory by multiplying the adjusted cost per test by the number of tests performed in the department of laboratory during November 2013, as listed in Table 6.

Table 6: RVU cost per period (November, 2013)

Medical tests	Weighted Average Cost per Test (1)	Relative Value per Test (2)	Adjusted Cost Per Tests (3) = (1) × (2)	Number of Tests performed (4)	Allocated Cost (Rs) 5 = (3) × (4)
CBP – ESR:					
Hb%	341.591	0.80	273	900	245700
HCT	341.591	0.48	164	300	49200
RBC	341.591	0.48	164	300	49200
MCV	341.591	0.48	164	300	49200
MCH	341.591	0.96	328	400	131200
MCHC	341.591	0.96	328	400	131200
RDW	341.591	0.96	328	400	131200
Platelet Count	341.591	1.76	601	200	120200
WBC	341.591	1.60	547	250	136750
Differential Leukocyte Count:					
Neutrophils	341.591	0.96	328	400	131200
Lymphocytes	341.591	0.96	328	400	131200
Monocytes	341.591	0.96	328	400	131200
Eosinophil's	341.591	0.96	328	400	131200
Basophils	341.591	0.96	328	400	131200
Reticulocyte	341.591	1.12	382	250	95500
ESR	341.591	1.60	547	300	164100
Total				6000	Rs.1,959,370

Source: Data tabulated by the researchers

Conclusions

The dialysis treatment at MSSH had direct costs of Rs.1,571,688 and allocated service centre costs of Rs.589,00, with expenses totalling Rs. 2,160,695. During the year that these costs were incurred, 5736 dialysis treatments were performed. Question: What is the full cost of dialysis treatment? Which type of cost system do you use? Answer: Since the department has a dialysis procedure as a product, the costs are connected to a procedure that involves dividing the total

costs according to the number of procedures performed. As a result, the full cost of dialysis is Rs. 376. This is a process costing system in which every unit functioned in the costing centre is comparatively identical. But in the department of laboratory there is a more complicated department that has 16 kinds of testing (CBP –ESR and Differential Leukocyte Count) and some of these tests required more time than others. To overcome this problem we used the most modern technique by integration of the relative value units RVUs and the process costing system. Production is measured in terms of the number of equivalent units of production, and a cost per unit (test) is found by dividing the total cost by the number of equivalent units. (The sum of the unit costs derived for the services rendered to each patient product). As such, the success of the application of the proposed methodology in the department of the laboratory of MSSH has yielded a successful application in other departments of the hospital. The hospital's administration now has information that effectively relates cost to price and relates the activities of the hospital's production system to the hospital's overall organisational objectives. Thus, the hospital's cost analysing presents beneficial data for the administration teams in a diversity of areas.

The process of analysing costs by department could provide the directors with worthy ideas concerning the way costs are systematised. According to the cost point of view, this could assist directors to place responsibility for costs and revenues on any cost centre. Information structured into multiple cost centres can be extremely useful for general pricing purposes. Cost data is not just data that management utilises for setting charges, however, they are significant ingredients. In negotiation a contract with a managed care institution, for example, a hospital is at an important disadvantage if it has no knowledge of its complete cost for services. When a hospital starts to calculate its budget, it will utilise the new data to create a good estimation of its funding needs. Quality of care, only costing data don't consider decisive decisions regarding the hospitals' tasks; nature of consideration being conveyed at every hospital should likewise be known. Costing outcomes should be explained with considerations and, where conceivable, connected to the quality work going on at these hospitals. Planning: cost accounting systems should start to provide an image of what costs are involved, at current value, in order to give hospital-based consideration. Such data must encourage into the arranging of asset portions to cost of In Hospitals, after alteration for any self-evident inefficiency. Efficiency providing services could be observed by looking at the unit costs of various offices over some undefined time frame. Examinations could likewise be made with different hospitals. Enhancing the cost-effectiveness of medical clinics is a basic equation in the general financing of human services of a nation. The increasingly proficient way of costing hospitals makes it feasible for more assets to be made accessible for much-required essential medical services. Unit costs could be valuable in choices on the setting of expense levels. Despite the fact that the overhead doesn't accentuate cost recuperation, the unit cost data may provide a sign of the degree of income for various services.

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