



TO ESTIMATE THE COST OF HLA TYPING IN PATHOLOGY USING ACTIVITY BASED COSTING.

Hospital Administration

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ABSTRACT

METHODOLOGY: Process mapping of HLA typing procedure: The entire process of HLA typing was broken down to various activities. Costing was done for each activity.

STUDY SETTING: Tertiary care teaching hospital in India

RESULTS: The Activity based costing method estimated the cost of HLA typing to be INR Rs.8649.04. Based on the estimated cost suggestions were made to raise the price to make the test financially viable to the laboratory.

KEYWORDS

AIM: To estimate the cost of HLA typing in Pathology using activity based costing.

METHODOLOGY:

Process mapping of HLA typing procedure: The entire process of HLA typing was broken down to various activities. Costing was done for each activity.

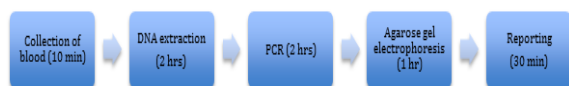
STUDY SETTING: Pathology laboratory in a Tertiary care teaching hospital in India

REVIEW OF LITERATURE:

The function of Major Histocompatibility Complex (MHC) molecules is to display peptide fragments of protein antigens for recognition by antigen specific T cells. It is important to review the structures and functions of these molecules because MHC molecules are fundamental to the recognition of antigens by T cells and are linked to many autoimmune diseases. MHC molecules were discovered as products of genes that evoke rejection of transplanted organs and their name derives from their role in determining tissue compatibility between individuals. In humans the MHC molecules are called human leucocyte antigens (HLA) because they were initially detected on leucocytes by the binding of antibodies. There are many alleles of MHC genes (in the thousands) in humans and each individual's HLA alleles differ from those inherited by most other individuals in the population. This constitutes a formidable barrier in organ transplantation.¹

OBSERVATIONS and RESULT:

Process mapping



The process for HLA typing involves the above-mentioned activities. Blood is collected from the potential donor as well as the patient followed by the process of DNA extraction which takes about 2 hours. It is then followed by PCR for 2 hours. Finally Agarose gel electrophoresis takes place for 1 hour followed by reporting which takes about 30 minutes.

Costs involved in the procedure

- Cost of building
- Cost of equipment

- Cost of maintenance of equipment
- Cost of Consumables
- Salaries of staff
- Salaries of 1 staff and 2 technicians
- Miscellaneous
- Electricity, Air-conditioning etc.

The study analyses the cost incurred at present for the process of HLA typing.

Cost of building and equipment have not been taken into account for the calculation of cost of the process because the building is more than 15 years old and is assumed to be depreciated. The building in which the HLA laboratory is located is used for various other purposes and the laboratory occupies a relatively small area in the building. Thus the cost of maintenance of the building apportioned for HLA typing only has been taken to be negligible.

Similarly the equipment is more than 5 years old so the value of the present value of the equipment is taken to be nil after depreciation.

Note: Building depreciation has been taken at the rate of 10% per annum.

Equipment depreciation has been taken at the rate of 20% per annum.

Activity based costing

Activity 1. Collection of blood

Costs involved:

Consumables:

1. Syringe
2. Centrifuge tubes
3. Glove
4. Anti coagulants

Activity 2. DNA extraction

Costs involved:

- I. Equipment:
 1. Laminar airflow chamber (90 min.)
 2. Spectrophotometer (5 min.)
 3. Shaker (2 min.)
 4. Refrigerator (24 hrs.)
 5. Deep Freezer (24 hrs.)
 6. Micropipettes
 7. Air conditioner (120 min.)

II. Consumables:

1. Micropipette tips (10 nos.)

2. Gloves (1 no.)
 3. DNA extraction kit (1 no.)
- Activity 3. Polymerase chain reaction (PCR) Costs involved:

I. Equipment:

1. PCR machine (90 minutes)
2. Micropipette
3. A.C (120 hrs.)

II. Consumables:

1. PCR kit (1)
2. Molecular weight marker (1)
3. Pipette tips (100)
4. Gloves (1)

Activity 4. Electrophoresis

- I. Equipment:
 1. Electrophoresis chamber (30 min.)
 2. Microwave oven (5 min.)
 3. Gel documentation machine (5 min.)
 4. Computer (60 min.)
 5. Electronic Balance 10 min.)
 6. Micropipette
 7. A.C. (60 min.)

II. Consumables:

1. Agarose powder (4 g)
2. Pipette tips (100)
3. Gloves (1)

Calculations

- Equipment depreciation @ 20% per annum NOT for older than 5 years
- Equipment maintenance / test =
- 4.2% of value + 12.36% Service Tax Avg. number of tests/year
- Consumables cost per test
- Electricity: A.C. : 2.1 units per ton per hour
- Computer maintenance: Rs. 5500 + 5.5% VAT + 12.36% service charge
- Salary: 8 working hours for 26 days/ month

Apportionment of salary:

- Salary per month = X (for $26 \times 8 = 208$ hours)
- Tests done per month = Y
- Time taken for the employee to perform the test = t
- Time taken / month for activity = Yt

An employee is paid a certain amount of salary per month (X) for working for 26 days or 208 hours. These 208 hours are spent on various professional activities. To calculate the amount of salary that is paid to the employee for performing a particular activity for the purpose of activity based costing, the time that the employee spends in carrying out the particular activity (in the study HLA typing) is calculated by multiplying the time taken for the employee to perform the test (t) with the number of tests done per month (Y).

Thus if he/she is paid X amount for all of his/her professional work, the amount paid only for HLA typing would be $(Y \times t \times X) \div 208$. The amount paid for other activities would be $X - \{(Y \times t \times X) \div 208\}$.

Cost involved	Equipment Maintenance	Consumable	Salary	Misc	Total
Activity					
Blood Collection		Rs. 20	Rs. 10.17		Rs.30.17
DNA extraction	Rs. 1114.62	Rs. 268	Rs. 122.10	Rs. 76.25	Rs.1580.97
PCR	Rs. 356	Rs. 5091.67	Rs. 122.10	Rs. 25.20	Rs.5594.97
Electrophoresis	Rs. 953.07	Rs. 126.56	Rs. 61.05	Rs. 25.20	Rs.1165.88
Reporting			Rs. 251.72	Rs. 25.20	Rs. 276.92
Total	Rs. 2423.69	Rs. 5506.23	Rs. 567.14	Rs. 151.85	Rs.8649.04

Total cost borne by the hospital for one test of HLA typing calculated through Activity based costing is Rs. 8649.04.

CONCLUSION:

An Activity Based Costing study was done for a procedure in a Pathology lab to estimate the cost incurred by the laboratory to perform the test. Based on the findings suggestions were made to modify the price of the test to make the test financially feasible. The following suggestions were given:

- Cost for HLA typing needs to be revised.
- Suggested cost with a 20% profit Rs. 10500/- owing to the recent increase in PCR kit price.

References

1. Kumar V, Abbas, Aster. Robbins and Cotran Pathologic basis of disease. 9th ed. Canada. Elsevier 2015. p 202.
2. Nand Dhameja. Finance for managers. 2nd ed. New Delhi. Jaypee Publishers Pvt. Ltd. 2010