



AN ESTIMATION OF ANESTHESIA AND DIALYSIS TECHNICIAN REQUIREMENTS AT ASTER MIMS, CALICUT APPLYING ERLANG METHOD

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Abstract

Human resource planning is a specific action plan which helps in meeting the manpower requirements of any organization. In hospitals, if right number and kind of people are not available then it may affect its services. Adequate staffing is essential to carry out the daily functioning of the hospitals and to be cost effective. The present study tries to estimate the number of anesthesia and dialysis technician required in the operation theatre at Aster MIMS, Calicut by applying Erlang method. It is a process study which divides the daily work load of each employee into individual smaller tasks and determines the time taken to perform each task and the total man hours required. The study was carried out based on 120 observations in the operation theatre which comprises of 60 observations (50 major surgery & 10 minor surgery) from anesthesia department and 60 observations from dialysis department. Erlang method was useful in assessing the shortage and excess of manpower in the hospital.

Key words: Erlang, Human resource planning, Staffing

Introduction

Healthcare has emerged as one of the largest sector in India due to its contribution in terms of revenue and employment. Hospitals, medical tourism, telemedicine, medical devices and equipment comes under healthcare. The enormous amount of investment made by public and private players in health care has accelerated its growth rate in India. According to India Brand Equity Foundation (2018), the healthcare

market is expected to grow over USD 372 billion by 2022, which is ten times more compared to the year 2005. The reason behind growth of this sector is the promotive economic environment, changing & stressful lifestyles, shift in disease patterns and increase in spending. The Indian healthcare sector is cost competitive compared to other Asian and Western countries. The surgery cost in India is one-tenth of any Western countries. Increasing amount of Foreign Direct Investment (FDI) has also made the healthcare market attractive.

In India, there are many well-trained and qualified medical professionals which has opened door to many private healthcare providers. The increasing population especially the population aged above 60 years has raised the demands for healthcare and has created a huge gap between the number of bed and number of patient ratio. It has lead to the need for quality healthcare providers. The healthcare sector in India is having lots of opportunities to the providers, payers, and medical technology. Due to the increasing competition, businesses are trying to adopt and invest in latest technology to gain a competitive advantage.

Studies carried out among nurses have highlighted that there is dissatisfaction due to the workload, mainly which are non-nursing work. As the qualified nurses and doctors are offered lucrative salary by the foreign hospitals, the attrition rate is high in Kerala. In the Government hospitals, the doctors and nurses are paid good salary and pay revisions are carried out from time to time. But the recruitment of the staff is made annually and not whenever there is a vacancy. This compels the healthcare staff to join in private hospitals. They are remunerated

comparatively very less as there is no government body to control the private hospitals. They are also forced to work for more than 8 hours without any overtime payment. As per the Nursing Council of India, the bed-nurse ratio should be 3:1, but actually one nurse handles around 15-20 beds. These may affect the services provided to the in-patients. Thus, the role of human resource planning is vital to the healthcare sector.

Human resource planning is the process of identifying the right number of people, right kind at the right place at the right time and right cost. It helps the organizations to recruit, maintain, and optimize the existing manpower to achieve the organizational objectives based on the environmental changes. The Human resource department conducts the skill analysis of the existing workforce, finds out any gap, and provides necessary training and development programmes. It ensures that there is a balance between the demand and supply of workforce. HRP is beneficial to the organization as it assists in managing the workforce strategically. If HRP is not done properly, then the organization may incur huge costs and will suffer financially. The vacancies will take time to be filled which will affect the work performance as the workload of the existing workforce will increase.

Malabar Institute of Medical Science (MIMS) is a multi-speciality hospital, having large number of employees with varied background. The hospital has more than 1500 employees including the doctors, nurses, paramedical and administrative staffs. The aim of the study is to check the effectiveness of manpower planning. The successes of every organization mainly depend upon the quality and quantity of its manpower planning. Therefore, it is a matter of necessity to practice effective human resource planning at MIMS, Calicut.

Literature Review

Human resource planning is a traditional concept and needs new tools and techniques for planning due to the rapid changes in the environment. It is vital for an organisation to achieve its long term objectives. Spearman (2011) mentioned that the HR department has to focus on recruiting talented people. For attracting talented applicants, there should be rigorous planning to be done. Ulrich (1987) added that human resource planning is an aid to development of

organizational functions which will help the organization to grow and succeed. Biles et.al (1980) stated that organisation tries to meet its strategic objectives by focusing on cost, functioning the operations effectively, and improving its ability to expand by acquiring new enterprise. Gould (1984) found that strategic human resource functions helps companies in gaining competitive advantage. While planning for future balance of human resource by considering the number of employees needed and availability of quality workforce, more time should be given to the human resource department to find out the optimum number of manpower requirements (Dwevedi, 2012). According to Noe et.al (2003), human resource planning needs to be implemented properly to tackle the likely problems and threats. Georg et al. (1980) stated that when the economic condition is worst, proper human resource planning will help the company to save cost. As per Zulch, Rottinger & Vollstedt (2004) to attain long-term competitiveness, it is necessary to utilize the human resources optimum. Human resource planning can be effective if it has a clear and specific objectives (Walker, 1990).

Objectives of the study

- To study about manpower planning policies and practices in the Anesthesia and Dialysis Department of MIMS.
- To find out the actual manpower requirements in Anesthesia and Dialysis department.
- To forecast staffing level needs for anesthesia and dialysis technician.

Methodology

The study was carried out based on observation in the operation theatre. 120 observations which comprises of 60 observations (50 major surgery & 10 minor surgery) from anesthesia department and 60 observations from dialysis department were considered for the purpose of the study. Manpower planning was done based on Erlang study using Microsoft Excel. An Erlang is a unit of telecommunications traffic measurement used to estimate the number of lines required in a network. It is done by conducting a process study initially and breaking the daily work load of each employee into individual smaller tasks, then calculate the number of employees that would be required in performing the task efficiently with

optimum use of human resources. This study, although not completely a replication of the actual Erlang Study, still manages to serve the purpose as it works on a principle that can be applicable universally.

Results and Discussion

I Procedure undertaken by an Anesthesia Technician

- Taking patient from pre-operative area
- Bring to Operation Theatre
- Insertion of IV cannula
- Giving anesthesia (intubation) of the patient
- According to the type of anesthesia giving position (General, Regional, Local Anesthesia)
- Drape the patient with sterile sheet
- Arranging the medicine for the patient which is used in between the case (antibiotics)
- After anesthesia documentation (anesthesia chart) is done
- After surgery giving reversal (extubation) to the patient
- Shifting the patient to the bed

- Taking patient to the post operative area
- Arranging the medicines and machines for the next surgery

Estimation of Anesthesia Technician by Erlang Method

Total number of Surgeries Observed = 60

Anesthesia Technician’s tasks

- Time spent preparing and planning the patient prior to the operation
- Time spent in transferring the patient from pre – op to OT
- Time spent in the OT when the surgery is performed
- Time spent in transferring the patient from OT to post – op
- Miscellaneous activities
 - Time spent in documentation
 - Time spent in other departments

Based on the Observational studies done in the OT, the Average time taken for each of the above mentioned tasks was calculated to arrive at the average total time spent by one anesthesia technician per surgery.

Table No. 1
Average Time taken for finishing a task

Task	Time taken – Major Surgery (Minutes)	Time taken – Minor Surgery (Minutes)
Man-hours spent in preparation and planning of patient prior to the operation	10.08	10.2
Man-hours spent in transferring the patient from pre – op to OT	4.88	4.7
Man-hours spent in the OT when the surgery is performed	105.14	23.5
Man-hours spent in transferring the patient from OT to post – op	1.00	1.00
Average Total Time	121.1	39.4

Source: Primary data

One year data of all the surgeries performed in the Operation Theatre complex in the year 2017 was analyzed to arrive at the average number of surgeries performed in a day, including major and minor.

Table No. 2
No. of Surgeries undertaken in the year 2017

Particulars	Numbers
Major Surgeries	9523
Minor Surgeries	1460

Source: Department of Health Information Management

From the data received, following are the calculations:

Total number of working days in a calendar year = 312 (Excluding Sundays)

Hence,

Average number of Major surgeries done per day = $9523 / 312 = 30.52 = 31$ (Rounded off)

Average number of Minor surgeries done per day = $1460 / 312 = 4.679 = 5$ (Rounded off)

Based on the calculation of the average number of surgeries performed in a day and average time spent by one anesthesia technician per surgery,

Total Man-hours of Anesthesia technician's currently per day =

(Average number of surgeries performed in a day) x (Average time spent by one anesthesia technician per surgery)

Hence, For Major Surgeries, Total Man-hours = $31 \times 121.1 = 3754$ minutes = 62.57 hours

For Minor Surgeries, Total Man-hours = $5 \times 30.9 = 154.5$ minutes = 2.58 hours

Total Man-hours in one day for Anesthesia Technician's is $62.57 + 2.58 = 65.15$ hours = 65 hours

In addition to the above mentioned tasks :

- Two anaesthesia technicians are posted mandatorily for night shift which begins from 5 pm to 8 am, which accounts for a working hour of 15 hours per technician. Hence, 30 man hours are used every day, irrespective of surgery posted.
- Man-hours spent in other departments were found to be 24 hours per day based on observation and interviews from the anaesthesia technicians.

Table No. 3
Total Man-hours per day

Particulars	Time taken (Hours)
Related to surgeries	65
Night duty (two deployed everyday)	30
Time spend in other department	24
Total Man-hours utilized per day	119

Source: Primary data

Erlang Calculation:

1. Total number of working hours permitted per employee is 8 hours, according to HR policy.
2. According to HR policy, a 30% Leave vacancy is recruited to account for employees taking leave.

Calculation: Total number of staff required = Total man hours utilized per day / 8

= $119 / 8$

= 14.875 = 15 (Rounded off)

Addition of 30% Leave Vacancy = 30% of 15 = 4.5 = 5 (Rounded off)

Hence, total number of Anesthesia Technicians' required = $15 + 5 = 20$

Table No. 4
Existing Anesthesia staff

Particulars	No. of staff
Anesthesia Technician	15
Trainee	8

Source: Secondary data

From the analysis, it is found that there is a deficit of 4 Anesthesia Technicians in the hospital.

An anesthesia technician has to be available at the eight operation theatre in Aster MIMS hospital and also have to visit the other departments like ESW, Endoscopy, Radiology,

and Oncology. 24 hours surgery are also undertaken in all these departments so they find it very difficult to manage all these departments. Major surgeries like liver transplant and kidney transplant which take more than 15 hours usually require a senior technician and a trainee since it is a complicated surgery so they cannot

go to other operation theatre till the surgery gets over. So, at present they have a shortage of 4 anaesthesia technicians which needs to be filled immediately to manage all the departments properly.

II Procedure undertaken by an Dialysis Technician

- ❖ Confirm the booking whether impatient/ outpatient.
- ❖ Keep the dialysis machine will all necessary sets ready for the procedures.
- ❖ Receive patient and check weight.
- ❖ Make him/her comfortable on bed.
- ❖ Access vital signs.
- ❖ Check doctor order for procedures (duration).
- ❖ Start procedure (start HD).
- ❖ Continuous monitoring of patient and recording.

- ❖ Termination of procedure after recommended time.
- ❖ Check vital signs and weight post HD.
- ❖ Sent the patient.
- ❖ Complete the records.
- ❖ Reprocessing the daily zee and blood tubing and keep ready for the next use.
- ❖ Clean the bed and machines and get the machine ready for the next case.

Estimation of Dialysis Technician by Erlang method

Total number of Dialysis Observed = 60
 Based on the Observational studies done in the Dialysis department, the Average time taken for each of the below mentioned dialysis was calculated to arrive at the conclusion that the total manpower required in the dialysis department.

Table No. 5
 Time taken for Hemo-dialysis and peritoneal dialysis in a month

Dialysis	Time taken (in hours)
Hemo-dialysis	4006.5
peritoneal dialysis	8

Source: Primary data

The time spends by technicians for various other procedures are:

- o Renal Biopsy = 45 x 14 (hours) = 630 (hours)
- o Perm Cath = 14 x 1.50 (hours)= 21 (hours)
- o Perm Cath removal = 45 x 6 (hours) =270(hours)

The time taken for reprocessing = 45 minutes that is ¾ hour
 = ¾ x 30 = 22.5 hours

Total hours in one month = 4006.5 + 8 + 630 + 21 + 270 + 22.5
 = 4958 (hours)

Total working hours per day = 4958/ 30 = 165.2666667

Erlang Calculation:

1. Total number of working hours permitted per employee is 8 hours, according to HR policy.
2. According to HR policy, a 30% Leave vacancy is recruited to account for employees taking leave.

Calculation:

Leave vacancy = Total working hours per day x 30 / 100= 165.2666667 x 30 / 100= 49.58

Total time work per day= Total working hours per day + leave vacancy= 165.2666667 + 49.58

Erlang = Total time / 8 (hours) = 26.85583333

Hence, the total manpower required= 27 (Rounded off)

Existing manpower = 29

The study was conducted for dialysis technicians; since the work is done by both the dialysis technicians and the nurses together it is difficult to take the time separately. So the total man power required is calculated for this department including nurses and dialysis technicians.

Table No. 6
Existing Dialysis Staff

Particulars	No. of Staff
Nurses	22
Dialysis technicians	7
Trainee	16

Source: Secondary data

From the analysis, it is found that the required manpower in dialysis department is 27. But at present there is a surplus of 2 people in the dialysis department.

In Dialysis department, there is an excess of two people so they are satisfied with their present manpower. Since both the nurses and dialysis technicians are doing the dialysis together they don't find any difficulty. Also, they have to handle only 10 patients at a time.

Conclusion and Limitations of the study

Human resource planning is an pivotal function carried out by the Human Resource Managers. If any error is done in the calculation and estimation of required manpower in hospitals then it may affect the productivity and efficiency of the existing workforce. In the budget allocation, staff costs contribute to a major portion so the hospitals are concentrating on the cost aspect. So, while carrying out the human resource planning function priority should be on the quality aspect also. Otherwise, it may lead to unnecessary wastage of funds. Either excess or shortage of manpower can have an impact on the services of the healthcare provider.

There are many methods for estimating the manpower in hospitals. The estimation of nurses in super-specialty hospitals are done based on the number of beds. However, this study have done the estimation of Anesthesia and Dialysis Technician with the help of Erlang method. Erlang methods considers the various tasks undertaken by the person and the time taken for carrying out each task to calculate the required number of manpower. The study reveals that there is an shortage of Anesthesia staff and excess of Dialysis staff. So, there is a need for systematic management and planning of manpower in hospitals to utilise the available limited resources efficiently.

The major limitations of the study is that is confined to Aster MIMS, Calicut only. Due to

the increasing number of in-patients in hospital, the other departments of the hospital was not considered. The administrators were reluctant to reveal certain data as they have a feeling that it may reveal their internal administration information.

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