



A STUDY OF HOSPITAL UTILISATION METRICS AS KEY PERFORMANCE INDICATORS IN A TERTIARY CARE HOSPITAL

Management

Dr Harshal More	Resident Administrator, Department of Hospital Admin, Armed Forces Medical College, Pune 411040, Maharashtra
Dr Shashikant Sharma*	Assistant Professor, Department of Hospital Admin, Armed Forces Medical College, Pune 411040, Maharashtra *Corresponding Author

ABSTRACT

The demand of quality healthcare services is currently increasing due to global demographic changes in type of clientele, pattern of diseases, ever changing treatment options and extensive commercialization and marketing of healthcare services. Healthcare cost is increasing day by day. Mechanical ventilation can run \$1500 per day and long term ICU care can run \$ 500 per day, thus consuming large amount of healthcare budget. Hospital utilization can be measured by measuring indices related to volume of services provided, character of individual utilizing those services and efficiency of hospital utilization. These indices will provide trends and pattern of hospital utilization which will aid in effective and efficient use of scarce hospital resources. This is a retrospective descriptive cross sectional study was carried out based on hospital records in a tertiary care hospital for the period 2014 to 2018. The indices measured were Average Length of Stay (9 to 10 days), Bed Occupancy Rate (70 to 75 percent), Bed Turn over Interval (4 to 5) & Bed Turn Over Rate (23 to 25). In this study we found that there were not many fluctuations in BOR, ALS, BTR and BTI. This indicates that the trend of utilisation of hospital facilities were same in all the years. These study shows that this hospital functioning as optimum level of bed occupancy & BTR. ALS & BTI for the hospital was found to be more than average.

KEYWORDS

Hospital Indices, Hospital Utilisation, ALS, BOR, BTI, BTR

BACKGROUND

World Health Organization (WHO) defines health as 'Health is a state of complete physical, mental and social wellbeing and not merely absence of disease or infirmity' (1)

Who expert committee, 1956 defines the hospital as, an integral part of a social and medical organization, the function of which is to provide for the population complete healthcare, both curative and preventive and whose outpatient services reach out to the family in its home environment; the hospital is also a centre for the training of health workers and for bio-social research. (2)

WHO defines a hospital bed as a bed that is regularly maintained and staffed for the accommodation and full-time care of a succession of inpatients and is situated in wards or a part of the hospital where continuous medical care for inpatients is provided. (3) The total of such beds constitutes the normally available bed complement of the hospital.

INCREASING HEALTHCARE COST

The demand of quality healthcare services is currently increasing due to global demographic changes in type of clientele, pattern of diseases, ever changing treatment options and extensive commercialization and marketing of healthcare services. Healthcare cost is increasing day by day. Mechanical ventilation can run \$1500 per day and long term ICU care can run \$ 500 per day, thus consuming large amount of healthcare budget. (4)

A study in 2013 shows that the OPD visit cost ranged from Rs. 94 in the district hospital to 2,213 INR in the private hospital. Inpatient stay costs were 345 INR in the private teaching hospital, 394 INR in the district hospital, 614 INR in the tertiary care hospital, 1,959 INR in the charitable hospital, and 6,997 INR in the private hospital. The emergency visit cost was lowest in the charitable hospital (385 INR) and highest in the private hospital (21,873 INR). Although the average cost of general surgical procedures was 2,605 INR in the district hospital, it was 8,362 INR in the general surgical operating theatre in the tertiary care hospital. Surgical procedures were very expensive in the private and charitable hospitals—24,016 INR and 27,430 INR per procedure, respectively. In the private teaching hospital, the average cost of general surgical procedures was 17,196 INR. Cost per admission at the neonatal intensive care unit of the charitable hospital was 6,539 INR, compared with 7,861 INR at the district hospital. Average cost of normal delivery was Rs. 1,222 in the district hospital and 2,387 INR in the private teaching hospital. (5)

HOSPITAL UTILIZATION

It is evident from the literature above that provision of inpatient care; in

turn a hospital bed is an expensive commodity and is the single most important factor in determination of hospital utilisation of country. The term hospital utilisation denotes the manner in which certain community makes use of hospital resources. Hospital utilization can be measured by measuring indices related to volume of services provided, character of individual utilizing those services and efficiency of hospital utilization. These indices will provide trends and pattern of hospital utilization which will aid in effective and efficient use of scarce hospital resources. Davis and Macula 1996 have described indices related to hospital namely Average Length of Stay, Bed Occupancy Rate & Bed Turnover Interval, Bed Turnover Rate and indices related to Hospital such as Admission Rate, Hospitalization rate per person, Bed occupancy rate & Bed/population Index. (6) Since the scope of the study is limited to utilization of hospital resources only Average Length of Stay (ALS), Bed Occupancy Rate (BOR), Bed Turnover Interval (BTI) & Bed Turnover Rate (BTR) are taken into consideration being representative of overall Hospital utilization.

BED OCCUPANCY RATE (BOR)

Bed Occupancy Rate (BOR) is the ratio of the average daily census to the bed compliment. BOR reflects the percentage of occupation of bed & popularity of the hospitals in terms of inpatients. The level of BOR also varies with the type of facilities available in the hospital. Usually larger the number of beds, the larger is the number of doctors also. As a result more facilities are provided and the level of medical care tends to be of a higher magnitude. 80- 85% BOR is ideal for good quality of patient care. 15-20% beds are vacant for emergency, maternity, isolation, intensive care. 100% occupancy is means over-utilisation and less than 80% is uneconomical. It is normally the case that the BOR in District Hospitals is higher than the BOR in the Area and Community Health Centers. It is considered that BOR above 85% have a negative impact on the safe and efficient operation of a hospital. Anand TR at al recommended that ideal BOR to be 80% - 90% [7]

AVERAGE LENGTH OF STAY (ALS)

The average length of stay (ALS) represents the time the patient is retained in the hospital. It is length of stay of patient day of admission in the hospital till the day of discharge. ALS in Hospital is indicator of efficiency. Shorter ALS will reduce the cost per discharge. As in the case of the turnover rate, a longer ALS is to be expected in the case of hospitals having better facilities, chronic diseases and organizational discharge policy, in the case of Community Health Centers where the level of treatment in general is lower, the average length of stay is likely to be less. Average admissions per year Hospitals with 500 or more beds in USA are 33,623 and ALS for the Hospitals with 500 or more beds are 5.5 days. (8) According to CRISIL's study, large

hospitals typically operate at 65-70% occupancy levels. Hospitals generally aim to operate at a high occupancy level and short ALS, which would enable them to record higher utilisation levels and ensure that more patients are treated at the same time. The ALS for cardiac cases is 5 days, orthopedic cases are 3-4 days, Oncology is 5-6 days and Neurosurgery is 8-10 days. In 2017, Fortis's average bed occupancy was 74% and Apollo's average bed occupancy has been in and around 60-61 per cent. Its average revenue per occupied bed (ARPOB) was Rs 1.48 crore, whereas Apollo's ARPOB was Rs 31,529 by FY17. Average Length of Stay (ALS), which is good for the hospital if patient is discharged as early as possible, stands at 3.46 days for Fortis, whereas the same was 4.04 days in the case of Apollo. (9)

BED TURNOVER INTERVAL (BTI)

Bed Turn Interval (BTI) is defined the average length of time (in days) that elapses between the discharge of one inpatient and the admission of the next inpatient to the same bed at specialty level/significant facility, over any period of time. It is the average period in days that a bed remains empty. Negative BTI indicates scarcity of beds and over-utilization. Long positive BTI is indicative of underutilization because of defective admission procedure or poor quality of medical care. Short positive (0.5) BTI is indicative of optimum utilization. BTI is 'zero, when bed occupancy is 100%.

BED TURNOVER RATE (BTR)

Bed Turnover Rate (BTR) denotes the number of times each hospital bed changed occupants. It indicates the use of available hospital beds and has been defined as a measure of productivity. A lower rate may be due to high ALS; however, when both are very low, it might imply either underutilization or overcapacity. It gives a net effect of changes in occupancy rate and ALS.

The role of Hospital can be fully studied only by taking into consideration all aspects of hospital services including inpatient and outpatient services. However the concept of Hospital utilisation statistics is relatively less known in our country. This study will provide an insight into how to calculate hospital utilization indices and careful interpretation of the same, thus identifying complex interdepartmental relationship and their linkage to utilization. It will also help in identification of less and over utilised facilities helping in redistribution of resources.

AIM

To calculate and study the trends of the hospital utilization indices, thus identifying less and over utilised facilities helping in redistribution of resources.

OBJECTIVES

- To calculate Bed Occupancy Rate (BOR), Average Length of Stay (ALS), Bed Turnover Rate (BTR) & Bed Turnover Interval (BTI).
- To Study the 5 years trends of the hospital utilization indices.
- To identify areas of less/ over utilized (department wise variation) facilities helping in redistribution of resources.

MATERIALS AND METHODS

A retrospective descriptive cross sectional study was carried out based on hospital records in a tertiary care hospital for the period 2014 to 2018. Data concerning inpatient admission, duration of stay, discharge, bed occupancy, deaths, average daily census and hospitalized inpatient days for the year 2014 to 2018 were collected from the medical record section of the hospital and entered into a predefined proforma. Trends of various indices over the last five year period (2014– 2018) were analysed. The information of entire hospital in total was also collected and hospital bed utilisation was calculated for those selected ones. The indices studied were

1. BOR= Average daily census x 100/Bed Compliment
2. ALS= Number of inpatient days care during the year/ Total number of discharge and death
3. BTR= Total number of patients discharged (including death)/Bed Compliment
4. BTI= Max Possible patient days - Actual patient day/Total discharges during the period (including deaths)

The data was compiled on Microsoft Excel worksheet and analysed using frequency mean, simple proportion and percentages

OBSERVATIONS

The Hospital is having a bed compliment of 1031 Beds. Table 1 shows

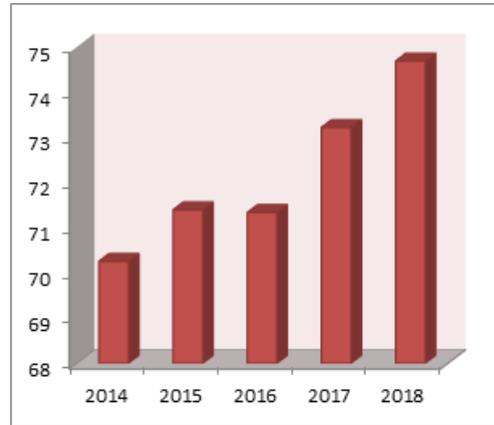
distribution of hospital indices from the year 2014 to 2018.

Table 1

Year	BOR (%)	ALS (Days)	BTR	BTI (Days)
2014	70.26	10.63	26.13	4.16
2015	71.4	10.4	24.4	4.81
2016	71.34	10.46	25.05	4.15
2017	73.22	10.07	26.57	3.68
2018	74.69	10.43	26.16	3.53

BOR- The overall bed occupancy was highest in year 2018 i.e. 74.69% and lowest in year 2014 i.e. 70.26%. It shows increasing trend in BOR. Fig 1

Figure 1 Showing BOR of the hospital



ALS - The ALS does not show much variation during five year period being highest in the year 2014(10.63 days) and lowest in 2016 (10.07 days). Fig 2 Department wise ALS was also calculated for the year 2018 as in Fig in which maximum ALS was for dermatology & Psychiatry (30.5 and 22.5days res) and minimum in pediatrics 2.5 days. Fig 3The reasons for higher ALS in specialty of dermatology & Psychiatry is organizational policy of detention of patients for the entire duration of treatment till the cure is achieved further the duration of treatment is as much long in this specialty, this leads to unusually overall high ALS of the Hospital, if we take out these outliers, the overall ALS of the Hospital is 7.68, which is in conscience with majority of the studies of E Ravikiran Et al. (10)

Figure 2 Showing ALS of the hospital

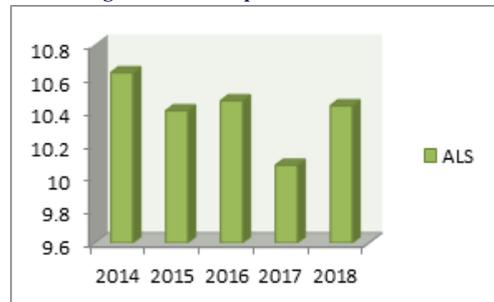
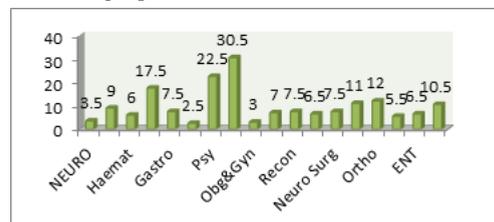


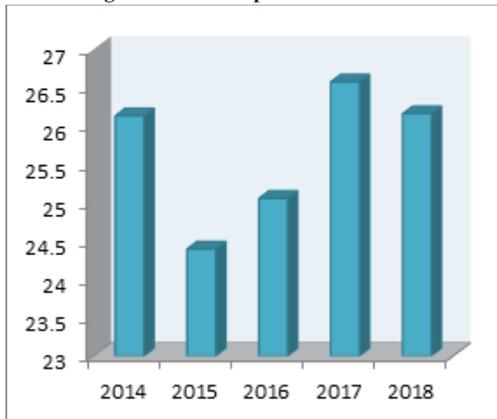
Figure 3 Showing department wise ALS



BTR - BTR observed to be highest for the year 2017 (26.57) and lowest in the year 2014 (24.39). (Fig 4) The BTR is an indirect indicator for hospital bed occupancy and workload faced by Hospital crew both of which carries significant implications for the quality of care received. A higher BTR indicated higher number of discharges per hospital bed in a given period of time, optimal occupancy and higher

ALS in our hospital setting is the reason for low BTR. Similar pattern was observed in similar study settings in a study done in tribal area of central India wherein the BTR was in the range of 38.5 with ALS of 5 days and BOR of 72.3%. (6)

Figure 4 Showing BTR of the Hospital



BTI - BTI was maximum for the year 2016(4.81) and minimum for 2018(3.53). (Fig 5) BTI indicates the number of days the bed remains vacant between one discharge and next admission on that bed. The BTI of 0.5 is considered too short to maintain and of more than 2 is considered high and suggest low demand. Higher BTI in our setting can be explained by low admission rate, low bed occupancy.

Fig 5 Showing BTI of the Hospital

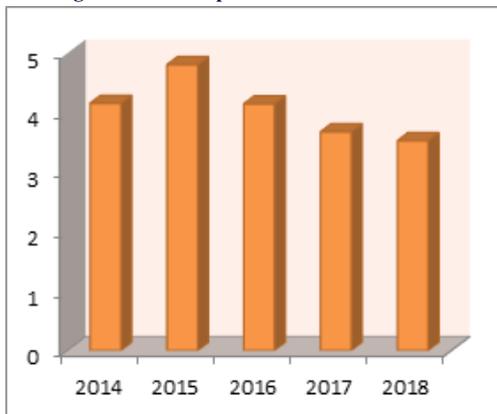
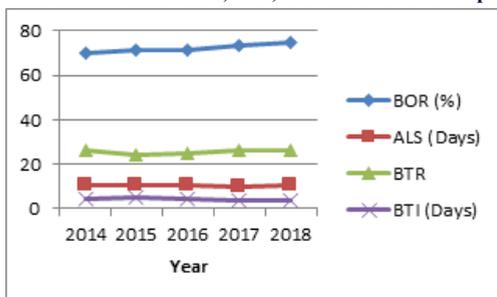


Figure 6 shows trends of BOR, ALS, BTR & BTI in the Hospital



DISCUSSION

In this study we found that there were not many fluctuations in BOR, ALS, BTR and BTI. This indicates that the trend of utilisation of hospital facilities were same in all the years. These study shows that this hospital functioning as optimum level of bed occupancy & BTR. ALS & BTI for the hospital was found to be more than average.

Our finding were similar to Borkar Et al.(6) and Thapa V Et al. (11) who also reported 75% BOR in their study and higher than Ravikiran E Et al. and Vaz FS Et al. (60%) each. (10, 12) Anand TR has considered BOR of 80-90% optimal. (7)

The average ALS for the hospital is 10.4 days. In our study ALS was maximum for Dermatology and Psychiatry and none of the studies

found to have similar results. Other studies were found to have an ALS of 3-5 days. (9) Vaz FS Et al. so found ALS of 6 days in his study while Thapa Et al. found very low ALS of 2.7 days. (11,12)

Anand TR also suggested that an ALS of 6 to 10 days as optimum (7). We also reported BTR of 25.66 and BTI of 4.06 days.

RECOMMENDATIONS

As shown in figure 6, Hospital utilisation indices do not show much variation over a five year period. This static trend gives us an advantage for accurate forecasting for provisioning of resources for each speciality. Bed Occupancy Rate were at optimal level however skewed distribution was found in ALS because of peculiar organisational policies of keeping the patient hospitalised till full care is achieved in Dermatology & Psychiatry Department. It is recommended that other options of home/ambulatory care needs to be explored in order to decrease ALS in these departments.

CONCLUSION

Hospital utilisation indices are an effective way of monitoring of scarce hospital resources. These indices should not be interpreted alone and independently. Combination of various indices in the form of Barber Johnson diagram gives a better picture of hospital utilisation. By studying different indices (BOR, ALS, BTR, BTI) it was found that hospital utilisation is near about optimal for this tertiary Care hospital looking after captive clientele. BOR was found to be less than 75%, however Skewed distribution of ALS was found because of peculiar discharge related organisational policies. Further study is also contemplated wherein month and department wise analysis will help to find high patient load spots.

CONFLICT OF INTEREST: None Declared

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