Hospital Utilization Statistics: Thirty-Five Year Trend Analysis, A Measure of Operational Efficiency of a Tertiary Care Teaching Institute in South India

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Abstract: *A hospital bed is both a scarce and expensive commodity in healthcare[4]. Dynamics of utilization of beds were studied retrospectively by observing the trend of expansion of bed-complements, bed occupancy rates (BOR), average length of stay (ALS) and bed turn-over rates (BTR) over a period of 35 years. Optimum utilization of hospital beds is the primary function of the administrator. The bed utilization indices should be used routinely to assess, analyze and improve the available resources.*

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I. INTRODUCTION:

Hospitals are the most important component of the health system in developing countries and account for about 50%-80% of total health costs [1,2]. A hospital bed is both a scarce and expensive commodity in healthcare[4].

It plays an important role in the health sector to have an effective, responsive promotion and improving public health. Hospitals are of great importance to analyze the efficient use of valuable resources and prevent fund loss [3].

The cost of making available a new bed varies between Rs. 50,000 to Rs. 100,000 and then there are additional costs of maintenance to be considered so as well [9].

The term "hospital utilization" devotes the manner in which a certain community makes use of its hospital resources. The hospital utilization statistics are also known a "patient movement statistics". Hospital utilization indices will provide trends and pattern of hospital utilization[8]. Bed utilization efficiency and hospital resource utilization are of prime importance to remove the "Hospital Bottlenecks". [7]

In recent decades, the efforts for reducing bed numbers and increasing the usage by patients along with reducing the length of stay and improving the admission process can have an impact on improving hospital performance, which result in lower cost for hospital by rising hospital bed occupancy rate, although that can lead to ascending hospital efficiency and tighter control of cost, but also to complications.[5]

In hospitals that are managed scientifically, bed occupancy rates range from 84% to 85% according to international standards, meaning the proper use of hospital facilities, hospital resources and success of its management. Fifteen to 16% consider the rest of the beds for medical emergencies (i.e. utilization of resources) have been optimal. According to the Ministry of Health and Medical Education, an award occupancy rate of more than 70% is desirable, between 60 and 70 is moderate and less than 60% is recommended [6].

Aim & Objective:
To study the pattern of hospital bed utilization in the last thirty-five years.

II. METHODOLOGY

A retrospective observational study. The data was collected from the medical records department and the following indices were analyzed from 1984 - 2018.
a) The average length of stay
b) Bed occupancy rate
c) Bed turnover rate

Average Length of Stay (ALS):
The average period (days) of stay in the hospital per admitted patient. It is calculated by the formula

$$ALS = \frac{\text{Total Patient days during the given period}}{\text{No. of discharges(including deaths) during that period}}$$

Bed Occupancy Rate (BOR):

The occupancy rate is a measure of utilization of the available bed capacity. It indicates the percentage of beds occupied by patients in a defined period of time, usually a year. It is computed using the following formula:

BOR= (Average daily census)/(**Bed** Complement) ×100

BED TURN OVER RATE

A measure of the frequency of bed utilization. It is given by the formula:

$$\textbf{Hospital Bed turnover rate} = \frac{\text{Number of discharges (including deaths) in a given time period}}{\text{Number of \textbf{beds} in the hospital during that time period.}}$$

BED COMPLEMENT
 The number of beds for the admission of inpatients and day cases using an inpatient bed.

Includes:
1. Beds in wards, including those open less than seven days per week
2. Beds in clinical facilities, e.g. intensive care units
3. Beds in cardiac care units
4. Beds in private rooms
5. Beds temporarily out of use
6. Cots in neonatal units
7. Beds in Accident and Emergency (A&E) wards which are staffed overnight
8. Unallocated beds
9. Beds in contractual and joint user hospitals

Excludes:
1. Beds in day bed units
2. Beds for day patients or hemodialysis patients
3. Temporary beds, e.g. stretchers or conventional hospital beds temporarily introduced
4. Observation or recovery beds in the Accident and Emergency (A&E) department, outpatient department or attached to the operating theatre which is used for only a few hours at a time and is not staffed overnight
5. Trolleys in fixed cubicles in outpatient departments
6. Labour suite beds, e.g. Birth day beds, birthing chairs or intensive care labor beds attached to the labor suite
7. Beds for nonpatients, e.g. beds for mothers accompanying sick children
8. Cots for healthy babies
9. Other special treatment beds or chairs, e.g. chairs that convert to recliners

III.   RESULTS
The institute excludes the following departments, as the services are not rendered:
1. Pediatrics
2. Ophthalmology
3. Otorhinolaryngology
4. Dentistry

Inpatient services are not provided in the following departments:
1. Endocrinology
2. Dermatology

3. Medical Genetics
4. Psychiatry
5. Geriatrics
6. Obstetrics & Gynaecology

The admission rate expectedly showed a rising trend from 5828 patients in 1984 to a total of 49069 patients admitted in 2018, an increase of 8.4 times over the thirty-five year period. The total number of beds increased by 5.2 times during the period 1984 to 2018, represented in table 1. The average length of stay (ALS) of patients during 1984 of 14 days gradually declined to 10 days in 2018. The bed occupancy rate (BOR) during the period 1984-2018 ranged from 69-97% and the bed turn-over rates varied from 23 – 39 during the same period. Year wise details of the average length of hospital stay (ALS), bed turnover rate (BTR) and bed occupancy rate(BOR), bed complement are depicted in Fig 2-5

Fig 1: Graphical Representation of IP Admissions
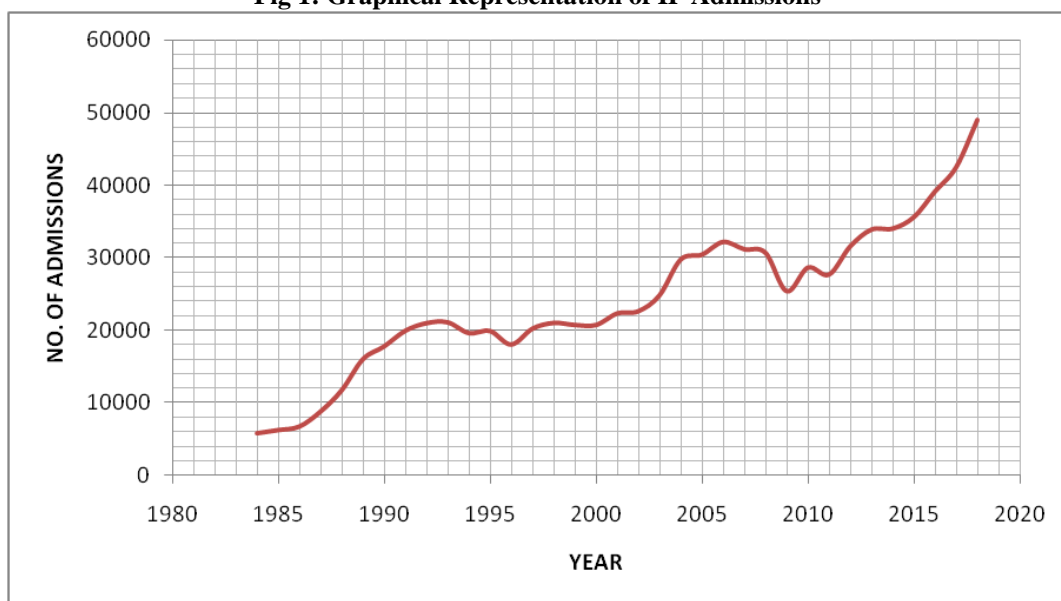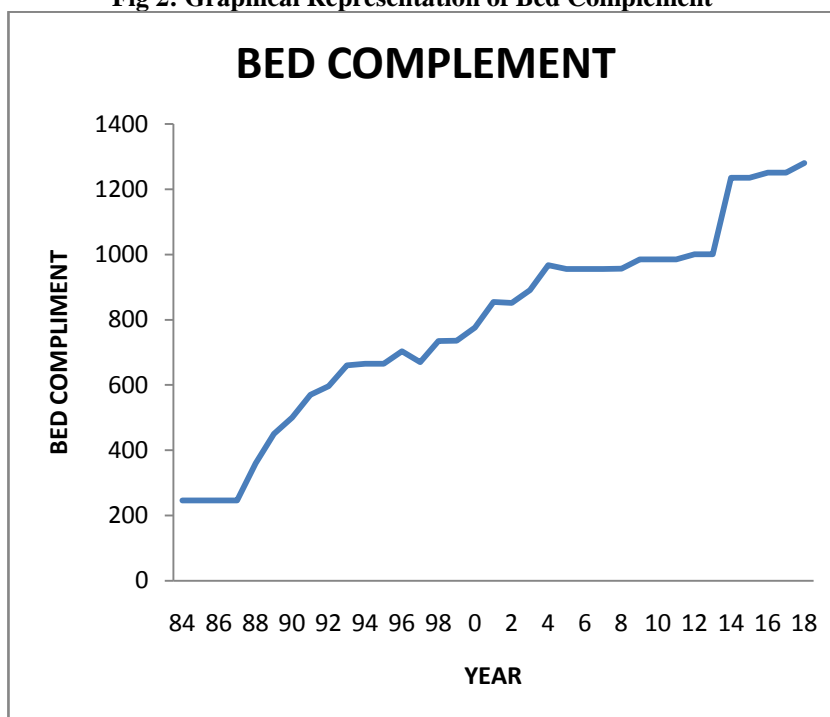

Fig 2: Graphical Representation of Bed Complement

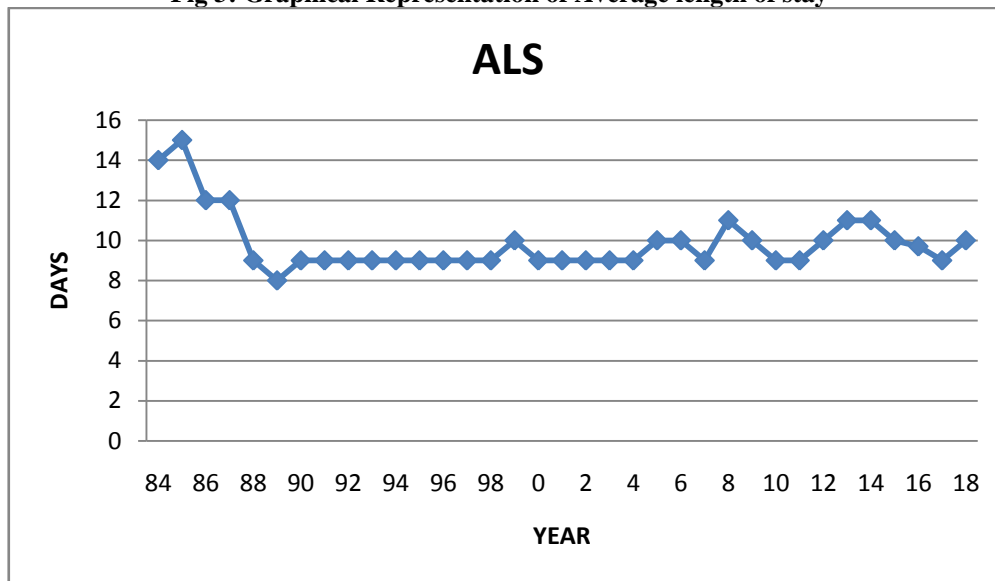**Fig 3: Graphical Representation of Average length of stay**
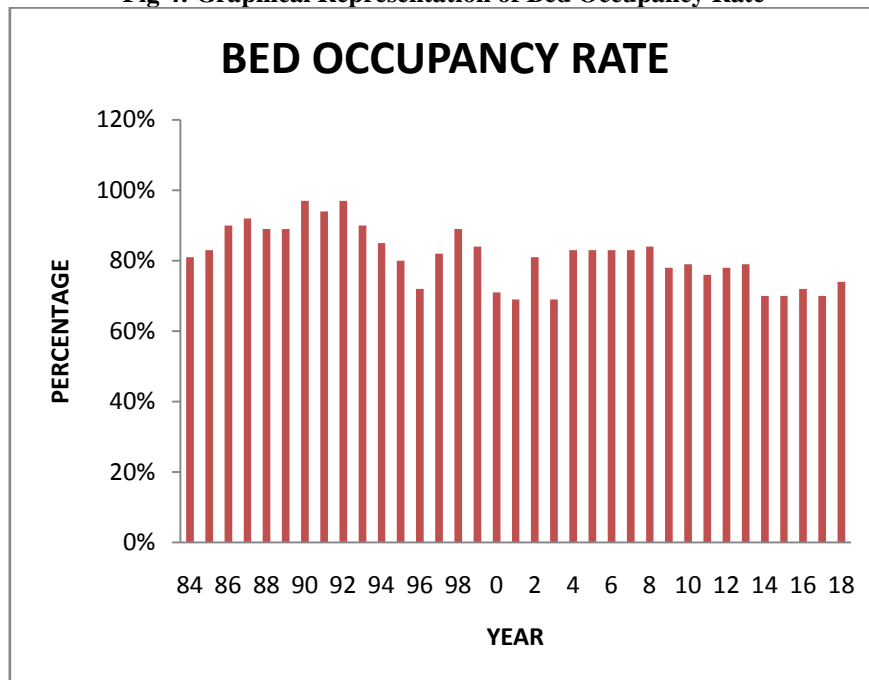

Fig 4: Graphical Representation of Bed Occupancy Rate
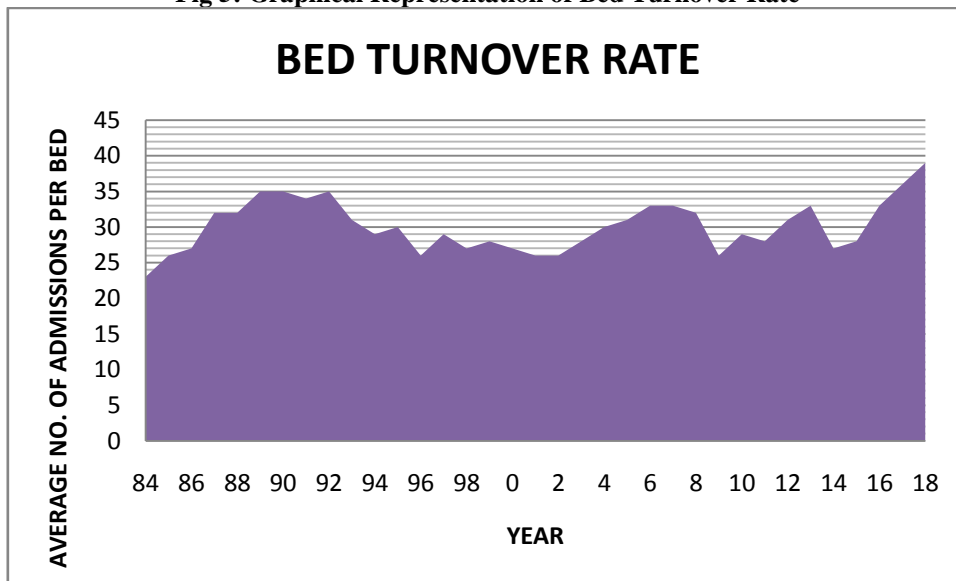
Fig 5: Graphical Representation of Bed Turnover Rate

BED TURNOVER RATE

Table 1: Hospital Indices Of Last 35 Years

YEAR	ADMISSIONS	BED COMPLEMENT	BOR	ALS (DAYS)	BED TURNOVER RATE
1984	5828	246	81%	14	23
1985	6271	246	83%	15	26
1986	6758	246	90%	12	27
1987	8830	246	92%	12	32
1988	11767	360	89%	9	32
1989	16052	450	89%	8	35
1990	17808	500	97%	9	35
1991	19971	570	94%	9	34
1992	21027	596	97%	9	35
1993	21137	660	90%	9	31
1994	19646	665	85%	9	29
1995	19939	665	80%	9	30
1996	18071	703	72%	9	26
1997	20259	670	82%	9	29
1998	21051	735	89%	9	27
1999	20778	736	84%	10	28
2000	20764	776	71%	9	27
2001	22359	854	69%	9	26
2002	22665	851	81%	9	26
2003	24877	891	69%	9	28
2004	29814	967	83%	9	30
2005	30481	955	83%	10	31
2006	32224	955	83%	10	33
2007	31227	955	83%	9	33
2008	30735	956	84%	11	32
2009	25438	985	78%	10	26
2010	28686	985	79%	9	29
2011	27731	985	76%	9	28
2012	31626	1000	78%	10	31
2013	33934	1000	79%	11	33
2014	34072	1235	70%	11	27
2015	35650	1235	70%	10	28
2016	39191	1251	72%	10	33
2017	42547	1251	70%	9	36
2018	49069	1280	74%	10	39

IV. Discussion

A hospital, like any facility or sub-facility providing services on an unscheduled basis, must balance the productivity of high utilization with the probability of being fully occupied and having to refuse service.[10] The administrator has essentially three controls upon these two measures: the bed complement, the admissions of elective patients, and the length of stay of patients within the hospital. The problems of management are complicated by various restrictions placed upon beds which prevent their use by all patients and thus increase the necessary number of beds. For example, use of beds is restricted by sex, age (pediatric, adult), service (medical, surgical, etc.), privacy (private, semi-private, ward), and other features (intensive care units, psychiatric, perinatal, etc.).

Tripathi [11] observed an average stay of 6.55-8.76 days. Thapa et al [9] reported 2.7 days as an average length of stay in a rural hospital in West Bengal. Kiran et al [12] reported an average length of stay of 9 days in a tertiary care hospital. Vaz and Colleagues [4] reported an average length of stay of 6.23 days in 1999 to 5.51 days in 2006. Anand [13] in his treatise on hospital services and management considered an average length of hospital stay of 6-10 days as optimum. Our observations compare well with these studies as well as the study by Alonao et al [14] in Spain who observed an average length of hospital stay of 11.5 days in 1988 and 9.5 days in 1995. However, it varies in sharp contrast with observations of Saha and others [7] who have reported a very high average length of stay of 14.02 days.

The bed occupancy rate (BOR) has been varied with an 81% occupancy in 1984, 97% in 1990 & 1992, as against 72% in 2000 & 74 % in 2018.It ranged from 69-97 %. The variation in bed occupancy rate may be attributed to the change in bed complement, expansion of the services in the institute. Our observations far exceed that of Kiran et al [12] who reported a very low bed occupancy rate of 50-60%. Vaz et al [4] reported an occupancy rate of 72.13% in 1999 and 83.12% in 2006. The high occupancy rate is an indicator of the rising pressures on the hospital as a result of increasing population and disproportionate health care facilities in the peripheries, especially at the specialty level. Cohan [15] reported a bed occupancy rate of 67.77 in an American hospital which is again considerably low as compared to our observations. However, our observations fall within the optional bed occupancy rate of 80-90% as described by Anand [13] in his treatise.

The bed turnover rate(BTR) for the hospital has seen an increasing trend from 23 in 1984 to 39 in 2018. This reflects the increasing admission rates and indicates improved efficiency regarding utilization of bed by the hospital. Saha et al [7] reported a bed turnover rate of 20-40 in their study which is similar to our observations. Dutta et al [16] reported a turnover ratio of more than 13.8 in their study of the gynecology wards of a district hospital.

Multiple factors play important roles in the effective and efficient utilization of hospital beds, which may be explored in future studies.

V. Conclusion

Efficient bed management not only helps to make up for the paucity of beds to some extent but also brings about significant financial benefits.As hospital administrators, we are in dire need of objective measures and methods to improve the utilization of the scarce resources which include hospital bed. Optimum utilization of hospital beds is the primary function of the administrator. The bed utilization indices should be used routinely to assess, analyze and improve the available resources. As administrators, we must focus on moving patients more efficiently through the system – increasing throughput – and have a well-organized bed management system in place which in turn help hospitals shorten lengths-of-stay, cuts demands on hospital supplies and personnel, solving the overcrowding in the Accident & Emergency department.

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