Outcome of care in an apex tertiary care referral institute of North India – A study of 90,000 patients

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Abstract

Introduction: Outcome of care is an important measure of quality in health care and also provides input for healthcare planning. It is an indicator which can be used for comparing performance of various hospital/Institute. **Aims:** Study intended to analyze the morbidity and mortality pattern among admitted patients with respect to selected hospital indices. **Study Settings**: All India Institute of Medical Sciences (AIIMS), New Delhi. **Subjects and Methods:** A cross-sectional retrospective study was conducted in 93,223 patients admitted at AIIMS, New Delhi. Information provided in Management Information System (MIS) was used for analysing morbidity as per International Statistical Classification of Diseases (ICD)-10. **Results**: Diseases related to the genitourinary system (14.25%) and neoplasms (14.18%) were the most common cause of admissions. Overall, predominance of adult age group (61.6%) followed by geriatric age group (20.5%) was observed. Male predominance was observed in diseases related to mental, behavioural, and neurodevelopmental disorders (89.2%). Overall, median length of stay was calculated to be 4 days (mean LOS-7 days), maximum for diseases related to mental, behavioural, and neurodevelopmental disorders (median 13 days). Gross and net death rate for admitted patients was calculated to be 4.3% and 3%, respectively, with maximum rate for diseases related to respiratory system (22.7% and 17%). **Conclusions**: Analysis of morbidity and mortality in high volume tertiary care centers and segregation of the patients according to their ailment and disease behaviour helps in establishing priorities in healthcare delivery system and thus allocating limited resources accordingly.

Keywords: Diagnosis, international classification of diseases, morbidity, mortality, outcome of care

Introduction

Outcome of care is a true measure of quality of care and has been described as effect of care over a period of time.[1] It is reflected by various indicators like patient discharge, gross, and net death rates, average length of stay (LOS) etc., Mortality and morbidity data of a hospital over a period of time foresees health seeking behavior of a community.[2] Apposite information regarding health statistics assists to establish priorities for policy planning and implementation.[3] Physicians at the primary healthcare centers play a vital role in public health referral system.[4] By implementing proper referral policy with appropriate knowledge about the burden of diseases, overstretching the resources of tertiary care healthcare facilities and apex centers can be controlled.[4,5]

Mainly, studies related to morbidity and mortality patterns are conducted across healthcare organizations focusing on a specific age group, specialty, or disease. A study conducted in Nigeria shows neonatal sepsis as a foremost reason of morbidity. Also, mortality among this age group was as high as 13.2%, and tetanus had the highest case fatality rate.[6] "Global and Regional

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Burden of Hospital Admissions for Pneumonia in Older Adults" estimated that worldwide hospital admissions for this age group (6.8 million episodes) resulted mainly due to clinical pneumonia.[7] Out of the 50,000 patients hospitalized in adult medical wards of Africa, greater part of patients (72%) had noncommunicable diseases as the primary cause. HIV, hypertension, and tuberculosis were other leading causes of morbidity and about 17% of patients expired during hospitalization.[8] Only few studies have been conducted in a high-volume tertiary care setting in India. There is a need to study the outcome of care, covering full spectrum of diseases, thus giving an overview on the quality of care.

Subjects and Methods

A cross-sectional retrospective record-based study was carried out in All India Institute of Medical Sciences, New Delhi, a 2300 bedded apex tertiary care referral institute comprising of various specialty and super-specialty center facilities with comprehensive services for teaching, research, and patient care.

All the inpatients discharged over a period of one year i.e., between 1st January 2016 and 31st December 2016 in the hospital and its super-specialty centers were included in the study. The data for the day-care/short admissions, incomplete data in terms of indexing as per ICD-10 coding and data not available on the Management Information System (MIS) (trauma care centre of AIIMS, Delhi) were excluded from the study. International Statistical Classification of Diseases (ICD-10) is the medical classification of disease categorized according to morbid entities assigned by the established criteria[9] and is broadly classified into 21 chapters.

The inpatient data available in MIS report on the e-hospital portal were compiled in Microsoft Excel software which included the profile of admitted patients, discharge type, admission day and time, discharge day and time, LOS, final diagnosis, and outcome of the patients. The diagnosis was classified and indexed either by the treating doctor or by the medical records personnel as per the contemporary ICD-10 coding system. The coding for the diagnosis provided in the MIS was arranged against the disease groups according to the 21 chapters of ICD-10. The final data of 93,223 patients were analyzed using SPSS version 24 statistical tool for descriptive frequencies of gender (male and female), age group (pediatric, adult, and geriatric), average LOS and death rates (gross and net death rates). Cross-tabulations were applied to the data to study hospital utilization indices.

Ethical clearance from Institutional Ethical Committee of AIIMS New Delhi (Ref. No. IEC-626/03.11.2017, RP-30/2017; Dated 23.11.2017) was obtained before the initiation of Data collection. The confidentiality of patient care data was maintained at all stages of the study.

Results

With respect to the total admitted patients, the preponderance of male patients (55.1%) over female patients (44.9%) was observed.

It was observed that out of the total admitted patients [Table 1], maximum numbers of patients were admitted for the diseases of the genitourinary system (14.25%) and were mainly adults (78.7%) with slight predominance toward females (53.5%) with median LOS of one day. Neoplasms (14.18%) were the second most common reason for the admission mainly involving adults (63.8%) equally distributed in both genders with median average length of stay (ALOS) of 6 days. Distribution of male patients among various chapters of ICD-10 varies from 46.5% to 67.5% except for the diseases described under ICD chapter of mental, behavioral, and neurodevelopmental disorders (89.2%); external causes of morbidity (73.4%); injury, poisoning, and consequences of external causes (72.6%).

Analysis of the patient care data with respect to the age group under various chapters of ICD-10 revealed that there was an overall predominance of adult patients (61.6%) followed by patients belonging to geriatric age group (20.5%) and pediatric age group (17.9%). In adult age group mental, behavioral and neurodevelopmental disorders (93.7%) and diseases of the genitourinary system (78.7%) were predominant. In the geriatric age group, it was found that maximum number of patients had diseases related to infectious and parasitic diseases (51.6%) and diseases related to respiratory system (39.4%) [Table 1]. In the pediatric age group diseases related to the conditions originating in perinatal period (95.5%) and congenital malformations, deformations and chromosomal disorders (70.9%) were predominantly observed. Disaggregate data revealed that there is significant gender wise variation in number of patients admitted in geriatric (male 61.7% and female 38.3%) and pediatrics (male 64% and female 36%) age groups as compared to adults (male 50.3% and female 49.7%) [Figure 1].

Due to skewed distribution of LOS among admitted patients, the median ALOS was calculated. Overall, median ALOS was found to be 4 days (mean-7 days and range-1-1424 days), with maximum for diseases related to mental, behavioral, and neurodevelopmental disorders (median-13 days) followed by diseases related to endocrine nutritional and metabolic disorders, nervous system (median-8 days) and musculoskeletal system and connective tissue disorders (median-8 days) [Table 1].
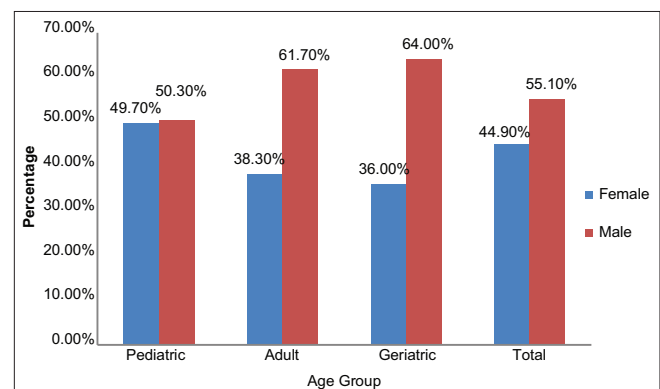

Figure 1: Gender-wise distribution of patients in various age groups

Table 1: Demographic profile of patients, average length of stay, gross death rate, and net death rate disaggregated as per ICD-10 chapters for classification of diseases, arranged in descending order of death rate

ICD-10 Chapter No	Name of chapter	Total [n] (%)	Gender		Age group			ALOS (Median)	Death Rate	
			Male [n] (%)	Female [n] (%)	Pediatric [n] (%)	Adult n (%)	Geriatric n (%)		Gross %	Net %
X	Diseases of the respiratory system	2368 (2.54)	1476 (62.3)	892 (37.7)	358 (15.1)	1076 (45.4)	934 (39.4)	06	22.7	17.0
III	Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	913 (0.98)	571 (62.5)	342 (37.5)	264 (28.9)	523 (57.3)	126 (13.8)	07	18.7	14.8
XVI	Certain conditions originating in the perinatal period	643 (0.69)	362 (56.3)	281 (43.7)	614 (95.5)	29 (4.5)	0 (0.0)	05	17.3	13.6
XI	Diseases of the digestive system	5217 (5.60)	3042 (58.3)	2175 (41.7)	372 (7.1)	3880 (74.4)	965 (18.5)	06	10.5	7.1
IX	Diseases of the circulatory system	6699 (7.19)	4525 (67.5)	2174 (32.5)	421 (6.3)	3847 57.4%)	2431 (36.3)	06	9.2	6.4
XVIII	Symptoms, signs, and abnormal clinical and laboratory findings, not elsewhere classified	1580 (1.70)	982 (62.2)	598 (37.8)	459 (29.1)	887 56.1%)	234 (14.8)	05	8.3	5.3
II	Neoplasms	13210 (14.18)	6632 (50.2)	6578 (49.8)	2094 (15.9)	8428 (63.8)	2688 (20.3)	06	6.3	4.6
VI	Diseases of the nervous system	2530 (2.71)	1630 (64.4)	900 (35.6)	459 (18.1)	1717 (67.9)	354 (14.0)	08	5.8	4.8
I	Certain infectious and parasitic diseases	6824 (7.32)	3847 (56.4)	2977 (43.6)	411 (6.0)	2891 (42.4)	3522 (51.6)	01	5.2	3.8
IV	Endocrine, nutritional, and metabolic diseases	1494 (1.60)	733 (49.1)	761 (50.9)	223 (14.9)	871 (58.3)	400 (26.8)	08	5.1	2.9
XVII	Congenital malformations, deformations, and chromosomal abnormalities	4586 (4.92)	3052 (66.5)	1534 (33.4)	3250 (70.9)	1241 (2,7.1)	95 (2.1)	07	4.0	3.1
XII	Diseases of the skin and subcutaneous tissue	663 (0.71)	355 (53.5)	308 (46.5)	52 (7.8)	511 (77.1)	100 (15.1)	07	2.7	2.0
XIX	Injury, poisoning, and certain other consequences of external causes	1297 (1.39)	941 (72.6)	356 (27.4)	258 (19.9)	858 (66.2)	181 (14.0)	04	1.5	1.2
XIV	Diseases of the genitourinary system	13283 (14.25)	6178 (46.5)	7105 (53.5)	854 (6.4)	10460 (78.7)	1969 (14.8)	01	1.4	0.9
XIII	Diseases of the musculoskeletal system and connective tissue	2648 (2.84)	1373 (51.2)	1311 (48.8)	129 (4.8)	1853 (69.0)	702 (26.2)	08	1.3	1.0
VIII	Diseases of the ear and mastoid process	330 (0.35)	194 (58.8)	136 (41.2)	130 (39.4)	183 (55.5)	17 (5.2)	06	0.3	0.3
XV	Pregnancy, childbirth, and the puerperium	4228 (4.54)	0 (0.0)	4228 (100)	23 (0.5)	4205 (99.5)	0 (0.0)	04	0.2	0.1

Contd...

		Total [n] (%)	Gender		Age group			ALOS (Median)	Death Rate	
ICD-10 Chapter No	Name of chapter		Male [n] (%)	Female [n] (%)	Pediatric [n] (%)	Adult n (%)	Geriatric n (%)		Gross %	Net %
XX	External causes of morbidity	1244 (1.33)	913 (73.4)	331 (26.6)	416 (33.4)	537 (43.2)	291 (23.4)	01	0.2	0.2
V	Mental, behavioral, and neurodevelopmental disorders	1607 (1.72)	1433 (89.2)	174 (10.8)	18 (1.1)	1506 (93.7)	83 (5.2)	13	0.1	0.1
XXI	Factors influencing health status and contact with health services	9503 (10.20)	4930 (51.9)	4573 (48.1)	3516 (37.0)	4895 (51.5)	1092 (11.5)	02	0.1	0.1
VII	Diseases of the eye and adnexa	12320 (13.22)	8170 (66.3)	4150 (33.7)	2355 (19.1)	6393 (51.9)	3572 (29.0)	04	0.0	0.0
	Total	93223	51366 (55.1)	41853 (44.9)	16676 (17.9)	57408 (61.6)	19139 (20.5)	04	4.3	3.0

Table 1: Contd...

It was also observed that the LOS was shorter in the geriatric age group patients, i.e., median of three days (mean - 6.56 days) as compared to pediatric age group of four days (mean - 7.69 days) and adults of 4 days (mean - 7.01 days); however, no significant variation was observed during the gender-wise analysis. LOS was more in the patients who succumbed to their illness during the course of treatment, i.e., median – 5 days (mean – 12.07 days) as compared to the patients who were treated and discharged subsequently, i.e., median – 4 days (mean - 7.32 days) [Figure 2].

Only 4.3% of patients succumbed to their illness during the course of treatment, whereas rest were discharged. Gross and net death rate was calculated to be 4.3% and 3%, respectively. Variation in mortality (gross and net death rates) among various disease groups was observed with a maximum for diseases related to respiratory system (22.7%/17%) followed by diseases related to blood and blood-forming organs and disorders involving the immune mechanism (18.7%/14.8%), disease related to perinatal period (17.3%/13.6%), etc., Mortality (gross and net death rate) was found to be minimum for the diseases of eye and adnexa (0/0) and mental, behavioral, and neurodevelopment disorders (0.1/0.1) [Tables 1 and 2]. Mortality was found to be maximum during the night shifts [Figure 3].

Discussion

The data on morbidity and mortality pattern in a hospital not only reflect the quality of care provided by the hospital but also aid the authorities/health administrators in decision making for future expansions and rational allocation of limited resources. Outcome indicators provide an opportunity for the comparison of quality of care with respect to other healthcare institutions, especially in a multidisciplinary setting. Goal is to control information gathered through regular practices of health system to forecaster the clinical outcomes and execute evidence based approach in improving outcome of care[10] and assess the transforming policies as the backdrop of healthcare evolution.[11] The outcome of care among the admitted patients was studied as per ICD-10 coding system.
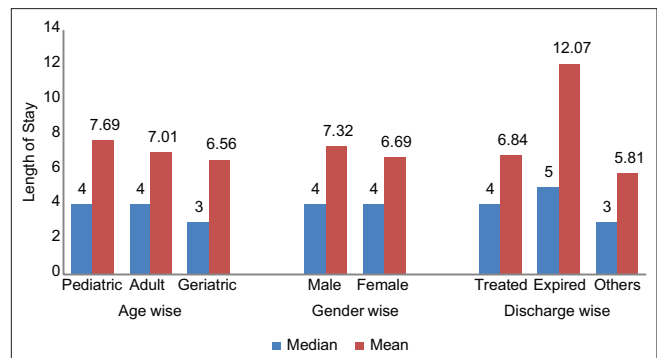

Figure 2: Length of stay against various parameters*.
*The outcome of admitted patients classified either by the treating doctor or by Medical Records Department was sub categorized for this study. Treated (Cured, improved, Inter Center Transfer, Procedure done and Technical Discharge for Long Admission), Expired and Others (Absconded, Discharge on Disciplinary Ground, Discharge on Request, LAMA, Procedure Cancel, Unchanged and Worse)

In this study, the diseases related to the genitourinary system (14.25%) followed by neoplasms (14.18%) respectively were the leading causes of morbidity among inpatients. Data from Ministry of Health & Family Welfare, Government of India (2005) reflect injuries (16.7%) followed by maternal and perinatal conditions (11.6%) as leading cause of illness.[12] This difference is been observed, as the present study did not have the data pertaining to trauma cases. In addition to these, various other studies conducted in medical wards of a hospital have revealed the major causes of morbidities were infectious and parasitic diseases, digestive system, respiratory, etc.[13-15] Variation in results may be explained as most of the studies compared have been conducted in particular department/specialties and not across an institute/hospital as big as AIIMS, New Delhi in India.

In this study, 55.1% of males were admitted during the study period and distribution of male patients among the various diseases groups ranged between 46.5% and 67.5% except for the diseases related to mental, behavioral, and neurodevelopmental disorders (89.2%), external causes

ICD-10 Chapter	ICD 10 chapter description	Total	Treated n (%)	Expired n (%)	Others n (%)
I	Certain infectious and parasitic diseases	6824	6411 (93.90%)	358 (5.20%)	55 (0.80%)
II	Neoplasms	13210	12001 (90.80%)	827 (6.30%)	382 (2.90%)
III	Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	913	727 (79.60%)	171 (18.70%)	15 (1.60%)
IV	Endocrine, nutritional, and metabolic diseases	1494	1399 (93.60%)	76 (5.10%)	19 (1.30%)
V	Mental, behavioral, and neurodevelopmental disorders	1607	1119 (69.60%)	2 (0.10%)	486 (30.20%)
VI	Diseases of the nervous system	2530	2363 (93.40%)	146 (5.80%)	21 (0.80%)
VII	Diseases of the eye and adnexa	12320	11619 (94.30%)	3 (0.00%)	698 (5.70%)
VIII	Diseases of the ear and mastoid process	330	326 (98.80%)	1 (0.30%)	3 (0.90%)
IX	Diseases of the circulatory system	6699	6022 (89.90%)	618 (9.20%)	59 (0.90%)
X	Diseases of the respiratory system	2368	1791 (75.60%)	538 (22.70%)	39 (1.60%)
XI	Diseases of the digestive system	5217	4575 (87.70%)	550 (10.50%)	92 (1.80%)
XII	Diseases of the skin and subcutaneous tissue	663	640 (96.50%)	18 (2.70%)	5 (0.80%)
XIII	Diseases of the musculoskeletal system and connective tissue	2684	2624 (97.80%)	35 (1.30%)	25 (0.90%)
XIV	Diseases of the genitourinary system	13283	12972 (97.70%)	180 (1.40%)	131 (1.00%)
XV	Pregnancy, childbirth, and the puerperium	4228	4166 (98.50%)	7 (0.20%)	55 (1.30%)
XVI	Certain conditions originating in the perinatal period	643	524 (81.50%)	111 (17.30%)	8 (1.20%)
XVII	Congenital malformations, deformations, and chromosomal abnormalities	4586	4346 (94.80%)	184 (4.00%)	56 (1.20%)
XVIII	Symptoms, signs, and abnormal clinical and laboratory findings, not elsewhere classified	1580	1405 (88.90%)	131 (8.30%)	44 (2.80%)
XIX	Injury, poisoning, and certain other consequences of external causes	1297	1248 (96.20%)	19 (1.50%)	30 (2.30%)
XX	External causes of morbidity	1244	1237 (99.40%)	2 (0.20%)	5 (0.40%)
XXI	Factors influencing health status and contact with health services	9503	9442 (99.40%)	13 (0.10%)	48 (0.50%)
	Total	93223	86957 (93.30%)	3990 (4.30%)	2276 (2.40%)

*The outcome of admitted patients classified either by the treating doctor or by Medical Records Department was subcategorized for this study. **Treated** (Cured, improved, Inter Center Transfer, Procedure done, and Technical Discharge for Long Admission), **Expired** and **Others** (Absconded, Discharge on Disciplinary Ground, Discharge on Request, LAMA, Procedure Cancel, Unchanged, and Worse)

of morbidity (73.4%) and injury, poisoning and other consequences of external causes (72.6%). Similar findings have been observed in a study conducted in the medical ward of Ethiopia with predominance of admission of male patients in diseases related to the respiratory system, infectious and parasitic diseases and nervous system.[15] Significant variation in gender-wise admission was observed in geriatric (male 61.7% and female 38.3%) and pediatrics (male 64% and female 36%) age groups as compared to adults (male 50.3% and female 49.7%). Similar findings have been observed in a study carried out in medicine and surgical departments.[16,17] Similarly, in a hospital in Nigeria out of total admissions, 65.9% were males and 34.1% were females.[18]

The overall predominance of adult patients (61.6%), followed by patients belonging to geriatric age group (20.5%), was observed in our study. Study conducted in a medicine ward of Nigeria showed 26.3% admissions belonged to geriatric age group.[18]
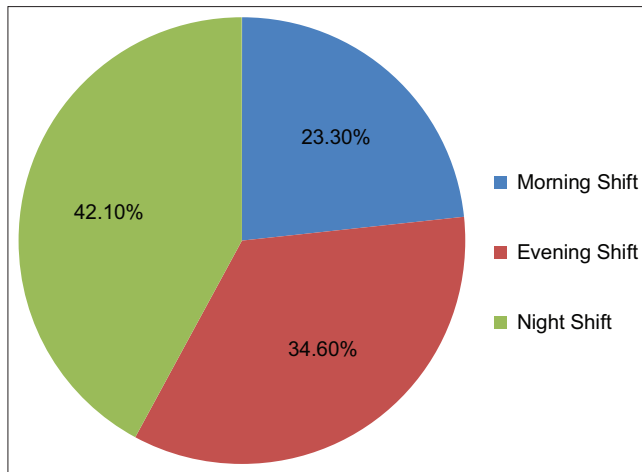
Figure 3: Admission-shift wise percentage of expired patients

Median LOS of 4 days was observed in this study and it was longer in the patients who expired during the course of treatment (median – 5 days) as compared to the patients who were treated and discharged (median – 4 days). In a study conducted in medical wards to assess an association of hospital stay with the outcome of care, the majority of patients improved and were discharged in 5-10 days and the patients who expired during the hospital stay remained in the hospital for <5 days.[15] A study in a medicine ward in a hospital in Nigeria, the mean LOS was 12.5 days and was 4.95 days in patients who expired.[18] Countries like Norway, Denmark, and the United States have average LOS less than five, whereas countries with the highest average LOS included Japan, followed by Korea.[19] In 2015, Bulgarian ALOS reported between less than five, whereas Hungary has less than 10 days. ALOS in Finland ranged over 10.5 days. Male patients spent more days than female patients in a hospital. ALOS in all EU Member States was found minimum for children and maximum for elderly patients.[20] A study conducted in Kathmandu revealed that ALOS at the time of death was less than 5 days.[21]

Gross and net death rate for the admitted patient was observed to be 4.3% and 3%, respectively, with maximum for diseases related to respiratory system (22.7%/17%). As per Global Burden of Disease deaths due to cardiovascular diseases remain highest (30.2%) followed by chronic respiratory diseases (8.47%).[22] A study evaluating 36 acute-care hospitals in Germany (2010) showed an average mortality of 2.3% with highest prominence for the diseases related to the circulatory system.[23] This may be due to the fact that study was conducted in New Delhi, which has one of the high rates of air pollution in the world and thus leading to more deaths due to respiratory illness.[24] In a study conducted in Nepal, respiratory tract infections caused mortality in 28% of inpatients, followed by central nervous system illness (14.5%) and gastrointestinal system illness (12.9%).[25] In a study conducted in medical wards of Ethiopia, 12.6% of patients expired in the hospital.[15] Similarly in Nigeria 12.3% of patients expired in medical wards during the course of treatment, mainly in the age group of 56.15 ± 19.63. It was also seen that 52.5% male

died. The crude mortality rates for male and female were 11.8% and 12.9%, respectively. Most of the deaths occurred in elderly patients (42.5%) as compared to middle-aged patients (25.1%).[16] In a study related to surgical admissions showed that the crude death rate among admitted patients was 9.14%, out of which 72.79% were males and 27.21% were females. Patients below 50 years contributed 64.44% of mortalities.[18] In a study conducted in Kathmandu, majority of deaths were at the extremes age groups, i.e., 12.95% were below 1 month of age and 36.84% belonged to geriatric age group. Diseases related to the respiratory system (38.87%), followed by infectious (20.64%) contributed to the major cause of death.[21]

Large sample size and analysis of the morbidity data of various speciality and superspeciality departments with classification as per ICD-10 is the underlying strength of this study. There are very few studies on outcome of care in India and rarely on big sample size in a tertiary care Institute. All India Institute of Medical Sciences, Delhi receives 60-70% of patients from Delhi itself and the rest 30-40% from the neighboring states like Uttar Pradesh, Bihar, Uttarakhand, etc., Although the results found in this study cannot depict the overall disease pattern of the country but probably can reflect changing trends of morbidity and mortality region-wise or overall. Also, as the study has been conducted only on admitted patients, the distribution of inpatient beds department wise may have an impact on overall observed morbidity and mortality pattern. This study has been carried out retrospectively utilizing patient care data captured from the MIS, hence, deals with a limited number of parameters being analyzed; however, it covers the essential parameters which reflect the outcome of care. It is suggested that in future prospective, multicentric larger studies may be conducted for a better understanding of the disease profile and outcome of care in Indian setting.

Conclusion

Diseases related to the genitourinary system and neoplasm were most common reasons of admission during the study period. Distribution of male patients was found more in diseases related to mental, behavioral, and neurodevelopmental disorders. Overall, median LOS was found to be 4 days, with a maximum for diseases related to mental, behavioral, and neurodevelopmental disorders followed by diseases related to endocrine nutritional and metabolic disorders. The finding in this study can help primary care physicians to look from there morbidity in the inpatients and catch them earliest of the disease. Analysis of morbidity and mortality in high volume tertiary care centres and segregation of the patients according to their ailment and disease behaviour helps in establishing priorities in healthcare delivery system and thus allocating limited resources rationally at various levels of healthcare delivery including primary care.

Conflicts of interest

There are no conflicts of interest.

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