

EVALUATION OF PROLONGED HOSPITAL BED OCCUPANCY IN A UNIVERSITY HOSPITAL

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ABSTRACT

Objective: In this study, we wanted to investigate the influence of variables such as age, gender, number of admissions, and units that hospitalized patients, on the duration of hospital stays of 241,341 patients who admitted to Cerrahpasa Faculty Hospital between March 2000 and February 2009. We tried to assess the relative contributions of short and long stay patients to overall occupancy rates. We also assessed the risk relating to prolonged admission.

Material and Method: Analysis of all admission episodes (n= 241,341) over a nine-year period in a large teaching hospital in Istanbul, serving a population of approximately 20,000,000. A logistic regression multi-factorial model was used to assess the effect of demographic and diagnostic variables on the length of stay.

Results: Prolonged stays (>56 days) were seen in 7,985

admission episodes (3.3%). These accounted for 22.2% of the overall bed occupancies. Male patients were at increased risk for prolonged admission compared with female. The risk of long stay admission was significantly increased in patients admitted to Gastroenterology, General Internal Medicine, Haematology, Metabolic Diseases, Dermatology, Physical Therapy and Rehabilitation, Psychiatry, Radiation Oncology, Orthopaedics and Neurosurgery were compared with Clinical Bacteriology and Infectious Diseases which the percentage of long stay admission was nearly the same of the total.

Conclusion: Factors the hospital for example time to surgery and radiology delays can control to reduce length of stay. The effects of paramedical reasons like process of material supply on long stay admission must be minimized.

Key Words: Bed occupancy, hospitalization, home care services, hospital-based, admitting department, hospital. *Nobel Med* 2011; 7(1): 68-73

BİR ÜNİVERSİTE HASTANESİNDEKİ UZUN SÜRELİ YATIŞLARIN DEĞERLENDİRİLMESİ

ÖZET

Amaç: Mart 200 ile Şubat 2009 tarihleri arasında Cerrahpaşa Tıp Fakültesi Hastanesinde yatarak tedavi gören 241.341 hastada yaş, cinsiyet, başvuru sayısı ve yatırılan birimin yatış süresi üzerine etkisi araştırılmıştır. Kısa (<55) ve uzun (>56) yatış sürelerine sahip hastaların yatak işgal oranları değerlendirilmiştir. Ayrıca uzamış yatışa yol açan riskler değerlendirilmiştir.

Materyal ve Metod: İstanbul'da yaklaşık olarak 20.000.000 nüfusa hizmet veren büyük bir eğitim hastanesine dokuz yıllık sürede başvuran tüm hastaların (n= 241.341) analizi yapılmıştır. Demografik ve tanısal değişkenlerin yatış süresine olan etkilerini istatistiksel olarak değerlendirmek için çok faktörlü lojistik regresyon modeli kullanılmıştır.

Bulgular: Uzamış yatış (>56 gün) 7985 olguda saptanmıştır (%3,3). Uzamış yatış süresine sahip hastaların yatak işgal oranı %22,2'dir. Erkek hastalar kadın hastalara göre daha uzun yatış riskine sahiptirler. Gastroenteroloji, Genel Dahiliye, Hematoloji, Metabolizma Hastalıkları, Dermatoloji, Fizik Tedavi Rehabilitasyon, Psikiyatri, Radyasyon Onkolojisi, Ortopedi ve Nöroşirurji servislerinde yatan hastalar Klinik Bakterioloji ve Enfeksiyon hastalıkları servisine göre daha uzun yatış riskine sahiptirler.

Sonuç: Hastaneye ait faktörler, örneğin ameliyat zamanı ve radyolojik tetkik gecikmeleri, kontrol edilerek yatış süresi kısaltılabilir. Uzun süreli yatış üzerine malzeme temini gibi paramedikal nedenlerin etkisi minimuma indirgenmelidir.

Anahtar Kelimeler: Yatak doluluğu, yataklı tedavi, evde bakım hizmetleri, hastane temelli, kabul bölümü, hastane. Nobel Med 2011; 7(1): 68-73

INTRODUCTION

The average length of stay is essentially an important and appropriate index for hospital bed administration¹. The average length of stay in hospitals is a statistical calculation often used for health planning purposes. Average days stayed in bed at hospital determine the effectiveness of the hospital. It is mentioned that patient of older age and patients with complicated diseases led to prolonged bed occupancies.^{2,3}

Large part of the health expenses in Turkey are covered by general budget.^{4,5} However, major part of the health expenses goes to curative services.

Hospitals, as health institutions with bed, cause an increase in health expenses. Effective bed using is crucial to an efficient Social Security Institution, which is the main payment institution for health expenses in Turkey. Social Security Institution accepts to pay for most diseases in fixed prices, and tries not to be influenced economically by the prolonged stays at hospital. Current targets suggest a decrease in mean occupancy as the most appropriate method of improving overall efficiency.

Long hospital stays lead to an increase directly by increased patient expenses and indirectly by increased number of new beds and new labour force, by increased office stocks and with higher electricity and water expenses. Prolonged hospitalisation not only increases the cost, but also is associated with other complications.⁶ Reducing the number of hospital

beds is one of the efforts through to restriction of the hospital expenses in the European countries. The decrease in the number of hospital beds can reach its aim only by reduction of staying period at hospital, in other words, by increasing the hospital turnover. It is mentioned that the differences between countries in staying periods at hospital not only occurred according to the complication of the disease, but also depended on the health system and the number of hospital beds.²

In this study, we wanted to investigate the influence of variables such as age, gender, number of admissions, and units that hospitalized patients, on the duration of hospital stays of 241,341 patients who admitted to Cerrahpasa Faculty Hospital, which is a sample of a university hospital, between March 2000 and February 2009. We try to assess the relative contributions of short and long stay patients to overall occupancy rates. We also assessed the risk relating to prolonged admission.

MATERIAL and METHOD

Study Population: Cerrahpasa Faculty of Medicine is a modern 1720 bed university teaching hospital providing acute and chronic services, including a department for geriatric patients and a department for cancer therapy. Common use of Patient Administration System has started at the end of January 2000. According to the data obtained from Patient Administration System, there were 341,690 hospitalized cases, and 4,265,152 out-patient appointments between March 2000 and February 2009. →

Table 1: The distribution of mean duration of stay in hospital in both genders by age groups

Age groups	Men (Number of patients)	Mean length of stay (days)	Women (Number of patients)	Mean length of stay (days)
<15	21,446	11.45±23.36	12,789	11.49±21.90
15–24	9,981	15.48±27.65	11,255	12.00±21.80
25–34	10,690	15.68±24.68	18,722	10.18±18.14
35–44	12,152	15.80±22.27	18,595	11.60±17.75
45–54	17,504	16.17±20.79	21,238	13.25±17.82
55–64	18,412	16.50±21.02	17,954	15.41±19.38
65–74	16,058	16.41±18.87	15,592	16.28±17.29
>74	8,209	15.88±18.24	10,774	16.72±17.74
	114,452	15.21± 22.25	126,919	13.24±18.97

Table 2: Mean age and mean length of stay in hospital by units

Units	Mean ages (years)	Mean Length of stay (days)
Geriatrics	75.8± 9.3	16.5±12.9
Chest Diseases	60.5±15.2	16.6±14.4
Physical Therapy and Rehabilitation	58.5±16.9	38.1±33.2
Cardiology	56.7±20.3	12.1±13.1
Radiation Oncology	55.2±17.3	30.4±23.6
General Internal Medicine	54.6±20.1	22.4±24.5
Cardiovascular Surgery	53.5±17.4	16.0±16.5
Urology	51.0±19.5	10.1±11.4
Dermatology	49.2±19.1	49.1±57.1
Chest Surgery	48.9±17.8	8.2±8.8
Neurology	48.7±25.1	14.8±12.5
Ophthalmology	46.9±23.8	11.5±12.3
Orthopaedics	45.9±22.4	16.9±24.0
Rheumatology	44.8±18.1	21.1±16.2
Neurosurgery	42.5±19.8	16.1±24.8
Haematology	42.4±23.2	23.1±39.4
Gastroenterology	42.2±22.6	15.3±22.5
Metabolic Diseases	42.0±28.1	18.3±22.0
Psychiatry	39.9±16.8	28.5±23.6
General Surgery	39.6±24.1	12.2±16.2
Obstetrics and Gynaecology	38.5±14.0	5.9±8.5
Ear Nose and Throat	35.4±20.6	7.14±14.5
Plastic and Reconstructive Surgery	34.7±22.5	11.8±18.2
Endocrinology	34.7±22.4	9.4±15.0
Nephrology	33.4±25.1	18.5±21.3
Clinical Bacteriology and Infectious Diseases	30.2±24.5	16.8±17.4

Our study was reviewed by the ethical committee of Cerrahpasa Medical Faculty and received approval with the rapport number of 10,958 and date of April 10, 2009.

Data acquisition: We extracted all admission data for the period between March 1, 2000 and February 28, 2009 from the Patient Administration System. Data including hospital number or personal identity number, date of birth and age, gender, admission date and admission unit, date of discharge, mode of discharge were obtained from the Department of Patient Administration System. Patients were hospitalized in related units according to their diagnoses, so there was no need to code the diagnoses. Patients, who were hospitalized in different units according to their age, although they had the same diagnosis, were accepted as hospitalized in the same unit. Patients who were admitted to emergency service, who were admitted for daily therapy and those who were admitted to intensive care unit were excluded from the study. The duration of admission was calculated by the interval between admission and discharge in complete days.

In general, there are no accepted criteria for prolonged stay. Three groups were categorized in National Health Bed Management; up to 14 days; 15–55 days; and 56–500 days. But there are some authors who mentioned the need for additional categories. In our study, we classified the duration of bed occupancies as <14 days; 15 – 55 days and > 56 days. For comparison between groups, we prospectively chose 56 days as a cut-off point.

Number of admission episodes of the patients was gathered in three groups as <10, 10–19 and >20.

Although ages of the patients were categorized in eight groups as; <15, 15–24, 25–34, 35–44, 45–54, 55–64, 65–74 and >75 for demographic demonstrations, we used age as raw data in logistic regression model.

Statistical analysis

Descriptive analysis of the demographics, administrative and clinical variables of patients involved was done in relation to their categorical duration of stay in hospital. Numerical variables are reported as means (SD). Categorical variables are presented as proportions of sample size. Length of stay was compared between men and women with student t test. Correlation between mean age and mean length of stay for each unit was made with Pearson Correlation test. The distribution of long stay admission for each unit evaluated with X² test.

To facilitate further analysis, we grouped the patients according to the units where they stayed related to their diagnoses. Subsequently, we categorized on the basis of presence or absence of the admission episodes to the unit. Short and long stay admissions were the dependent variable of the logistic model. →

Units were defined in 26 categories as; General Surgery, Endocrinology, Gastroenterology, General Internal Medicine, Haematology, Metabolic Diseases, Nephrology, Geriatrics, Rheumatology, Dermatology, Physical Therapy and Rehabilitation, Chest Diseases, Clinical Bacteriology and Infectious Diseases, Cardiology, Neurology, Psychiatry, Radiation Oncology, Chest Surgery, Ophthalmology, Obstetrics and Gynaecology, Cardiovascular Surgery, Ear, Nose, and Throat, Neurosurgery, Orthopaedics, Plastic and Reconstructive Surgery, and Urology. Combined with age and gender, these units were introduced into a multivariable logistic regression model, with results presented as odds ratios (ORs) (95% confidence intervals [CIs]) and associated p values. Enter method of logistic regression model was used in the study. Female gender and Clinical Bacteriology and Infectious Diseases used as a reference in the model.

RESULTS

The factors that could influence prolonged hospital bed occupancies were investigated in our study. Between March 2000 and February 2009, there were 341690 admission episodes to Cerrahpasa Faculty of Medicine for treatment by hospitalized. After the exclusions outlined in the material and methods section, 241,341 (70.6%) episodes were available for further study.

Of the total, 114,452 (47.4%) patients were male, where the rest 126,919 (52.6%) were female. Patients' mean (SD) age was 43.6 ± 22.8 years, where median age was 46 years. Table 1 gives the mean length of stay of all groups of patients. The most frequent admissions were found in the 45-54 age group ($n= 38,742$ 16.0%) (Table1). Mean length of hospitalization was 14.2 ± 20.6 days. The difference between men and women according to the mean length of stay in hospital is statistically significant ($t: 23,444$, $p<0.001$)

Table 2 gives the mean age and mean length of stay by the units. The oldest aged patients (75.78 ± 9.27) stayed in geriatric unit as expected. Longest length of stay was seen in Dermatology unit (49.14 ± 57.06).

There is positive correlation between the age and length of stay (Pearson correlation $r: 0.81$, $p<0.001$).

The total number of bed-days for 241,341 patients was 3,420,653. The distribution of the patients' number of admissions and number of occupied bed days according to groups of length of stay was given in the table 3. Vast majority of admissions (168,748/241,341, 69.9%) lasted <14 days. Prolonged stay (>56 days) was seen in 7,985 episodes (3.3%). These were accounted for 22.2% of the overall bed occupancy

Table 3: The distribution of the patients' number of admissions and number of occupied bed days according to groups of length of stay

Number of stayed days per admission	<14	15 - 55	>56	Total
Number (%) of admissions	168,748 (69.9)	64,608 (26.8)	7,985 (3.3)	241,341 (100.0)
Number (%) of occupied bed-days	986,365 (28.8)	1,674,613 (49.0)	759,816 (22.2)	3,420,794 (100.0)

Table 4: Analysis of the units according to Long Stay Admission (>56)

Predictors	Total admissions	Long-stay admissions	% of Long-stay admissions	P X ² test has been used to each units separately
Dermatology	1451	412	28.4	<0.001
Haematology	13391	1490	11.1	<0.001
Physical Therapy and Rehabilitation	5791	757	13.1	<0.001
General Internal Medicine	4187	272	6.5	<0.001
Orthopaedics	9287	413	4.4	<0.001
Neurosurgery	10968	452	4.1	<0.001
Gastroenterology	9064	409	4.5	<0.001
Psychiatry	3302	251	7.6	<0.001
Nephrology	4487	205	4.6	<0.001
Plastic and Reconstructive Surgery	8208	246	3.0	0.056
Metabolic Diseases	3342	130	3.9	<0.05
Radiation Oncology	2732	363	13.3	<0.001
Clinical Bacteriology and Infectious Diseases	5541	191	3.4	0.290
General Surgery	51484	1093	2.1	<0.001
Cardiovascular Surgery	5157	199	4.1	0.331
Ear Nose and Throat	15473	212	1.4	<0.001
Geriatrics	2123	40	1.9	<0.001
Urology	5463	54	1.0	<0.001
Endocrinology	6543	82	1.3	<0.001
Chest Diseases	7251	158	2.2	<0.001
Rheumatology	1994	38	1.9	<0.001
Neurology	8566	115	1.3	<0.001
Ophthalmology	12988	165	1.3	<0.001
Obstetrics and Gynaecology	26938	105	0.4	<0.001
Cardiology	14243	123	0.9	<0.001
Chest Surgery	1367	10	0.7	<0.001
Total	241341	7985	3.3	<0.001

over the 9 year period. There was no correlation found between the number of admission and length of stay (Pearson correlation $r: 0.007$, $p<0.001$). On the other hand number of occupied bed days was found highest among the patients where stay between 15–55 days (49.0%).

The distribution of prolonged hospital stay (>56 days) in total was found statistically significant when it was →

Table 5: Analyses of predictors of prolonged hospital stay (>56 days)

Predictors	Sig.	Exp (B)	95.0% CI	
			Lower	Upper
Gender				
Female		1.00 (Ref.Cat)		
Male	<0.001	1.28	1.22	1.35
Units				
Clinical Bacteriology and Infectious Diseases		1.00 (Ref. Cat)		
Gastroenterology	<0.001	1.41	1.18	1.68
General Internal Medicine	<0.001	2.25	1.86	2.73
Haematology	<0.001	3.28	2.81	3.82
Metabolic Diseases	0.001	1.39	1.14	1.70
Dermatology	<0.001	12.66	10.52	15.25
Physical Therapy and Rehabilitation	<0.001	5.25	4.44	6.21
Psychiatry	<0.001	2.46	2.02	2.99
Radiation Oncology	<0.001	4.94	4.11	5.94
Orthopaedics	<0.001	1.45	1.21	1.73
Neurosurgery	0.003	1.30	1.09	1.54
General Surgery	<0.001	0.65	0.56	0.77
Endocrinology	<0.001	0.38	0.29	0.49
Nephrology	0.015	0.65	0.46	0.92
Rheumatology	0.006	0.61	.42	0.86
Chest Diseases	0.004	0.72	0.58	0.90
Cardiology	<0.001	0.27	0.22	0.35
Neurology	<0.001	0.42	0.33	0.53
Chest Surgery	<0.001	0.22	0.11	0.42
Ophthalmology	<0.001	0.39	0.31	0.48
Obstetrics and Gynaecology	<0.001	0.13	0.10	0.17
Urology	<0.001	0.29	0.22	0.40
Ear, Nose and Throat	<0.001	0.39	0.32	0.48
Age	<0.001	0.995	0.994	0.996

compared to short term stayed (<55 days) (kikare: $p<0.001$) But it was not found statistically significant in the Plastic and Reconstructive Surgery, Clinical Bacteriology and Infectious Diseases and Cardiovascular Surgery units (Table 4)

We also assessed age, gender and admission to the units as a risk of related to prolonged admission with logistic regression. Men were at increased risk of very prolonged stay (OR 1.13, $p<0.001$) when it was compared with women. The risk of long-stay admission was significantly increased in patients admitted to Gastroenterology (OR 1.41), General Internal Medicine (OR 2.25) Haematology (OR 3.28), Metabolic Diseases (OR 1.39) Dermatology (OR 12.66), Physical Therapy and Rehabilitation (OR 5.25), Psychiatry (OR 2.46) Radiation Oncology (OR 4.94), Orthopaedics (OR 1.45) and Neurosurgery (OR 1.30) were compared with Clinical Bacteriology and Infectious Diseases which the percentage of Long stay admission was nearly the same of the total. In contrast, patients admitted to General Surgery (OR

0.65), Endocrinology (OR 0.46), Nephrology (OR 0.65), Rheumatology (OR 0.61), Chest Diseases (OR 0.72) Cardiology (OR 0.27), Neurology (OR 0.42), Chest Surgery (OR 0.22), Ophthalmology (OR 0.39), Obstetrics and Gynaecology (OR 0.13), Urology (OR 0.29), Ear, Throat and Nose (OR 0.39) were significantly less likely to stay for >56 days compared to Clinical Bacteriology and Infectious Diseases (Table 5). Increasing age was not found as a risk related to prolonged admission although positive correlation was found between age and length of stay.

DISCUSSION

Bed occupancy and its associated problems are emotive subjects in every health system and also in Turkey. Ham and colleagues concluded in their analysis of hospital bed use in the NHS that the differences in length of stay were more important than differences in admission rates in accounting for overall differences in bed-day use⁶.

This study has some limitations. Firstly, it does not allow us to comment on whether the discharge in individual admission episodes were appropriate or delayed, nor can we ascertain whether the discharges were delayed for reasons other than medical status. 3.3% of patients stayed >56 days; the vast majority was discharged earlier. Further work is required to determine the factors that necessitate hospitalization for >56 days, and we suggest that a prospective study would be appropriate and essential to identify where resources may be used best in this area. On the other hand we could not be able to evaluate the relation between diagnoses and prolonged stays at hospital because of the insufficient and unreliable diagnostic data⁷.

Although lots have been said about bed occupancy, there are a few studies on bed occupancy, so it is difficult to discuss our study with similar ones.^{1-3,8} It has been stated in restricted numbers of studies that older age and number of admission lead to delay on discharge from hospital⁹. In our study there was a positive correlation between age and length of stay. Our results are similar to such studies in this manner, and our study supports the idea that insists bed-day occupancy is longer among the patients of older age.⁹⁻

¹¹ In the study we found the length of stay significantly longer in males compared with females. This finding is not same with the study done by Rozzini et al., who were suggesting a poor survivorship of males with increasing age.¹² We found longest mean duration of stay in Dermatology, followed by Physical Therapy and Rehabilitation and Radiation Oncology. These units are the units where the chronically ill patients get →

treated. This findings support the idea that chronically ill patients have longer length of stay⁹

Mean length of stay at hospital was 14.2 ± 20.6 days. Prolonged stay at hospital causes an increase in the need of new hospital beds. Cerrahpasa Medical Faculty is a good sample for this idea with 1720 beds. The frequency of turnover was monthly twice. Beds in Cerrahpasa Faculty of Medicine constitute 20% of hospital beds in Istanbul, where the population reaches up to 20 million. Low turnover frequency and its cause must be questioned, as cost effectiveness of a hospital decreases and cost of health services become more expensive when there is a low turnover frequency.

In the study, we found that men are at increased risk for very prolonged stay compared to women. This result is not concordant with result of the study done by Quinn MP and his colleagues³. This opposition can be explained with shortest time hospitalized patient were being female. According to the results of our study being in younger age increase the risk of long stay admission. This condition is not concordant also reported by Quinn MP and his colleagues and reported by Seymour D.G and Pringle R^{3,13,14}. This opposition can be explained by the shortest time hospitalized of the oldest patients due to death.

In the study we found that patients who admitted to Gastroenterology, General Internal Medicine, Haematology, Metabolic Diseases, Dermatology,

Physical Therapy and Rehabilitation, Psychiatry Radiation Oncology, Orthopaedics and Neurosurgery were at increased risk for very prolonged stay compared with Clinical Bacteriology and Infectious Diseases. This finding supports the idea that chronically ill patients occupy the hospital beds longer than others⁹. Length of stay is a worldwide problem of health services. Due to this problem in many countries discharge planning is a routine feature of health systems. It was reported that length of stay was significantly reduced for patients allocated discharge planning¹⁵.

CONCLUSION

These types of studies are needed in order to establish standards in the duration of hospitalized. These studies should depend on reliable data, to obtain reliable data, medical data must be recorded and kept correctly according to ICD10 standards. Factors the hospital for example time to surgery and radiology delays can control to reduce length of stay. The effects of paramedical reasons like process of material supply on long stay admission must be minimized.

The result of the study is important for well health management. For good health planning there is need of this kind of studies.

On the other hand, in order to reduce the length of stay establishing and progressing of home care facilities should be considered.



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