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Factors influencing length of stay in the Emergency Department in a Private Hospital in North Jakarta

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ABSTRACT

Length of stay (LOS) is a key measure of Emergency Department (ED) throughput and a marker of quality objectives. Time studies that assess ED services may help to clarify the causes of prolonged ED service to patients. The objective of this study was to analyse factors influencing LOS in the ED of Private Hospital X. This study was conducted at the ED of Private Hospital X in North Jakarta. One hundred and seventy one adult patients were admitted via the over a period of three weeks in March 2008. Data recorded included characteristics of patients, service time of nurses, service time of physicians, and overall ED LOS. Anova and independent t-test were performed to determine factors associated with ED LOS. Elderly patients, patients in emergency status, patients with letters of referral, electrocardiogram (ECG) training for physicians and advance cardiac life support (ACLS) training for nurses were significantly associated with duration of service in the ED. Mean ED LOS was 50 ± 20.7 minutes. Patient category and characteristics of physicians and nurses are important independent variables that influence the ED's duration of service. Future research is necessary to determine how these and other factors can be incorporated into a model for predicting ED LOS.

Keywords : Length of stay, emergency department, quality objective

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INTRODUCTION

Patient visits to the Emergency Department (ED) have recently increased rapidly. In 1990 ED services in America increased 106% from those in 1980, while in the year 2002 ED visits reached 110.2 million and increased by 23% from the 90 million visits occurring in 1992.[1] In New South Wales in 1994 - 1995 1.5 million patients came to the ED for treatment. In 1999 - 2000 their numbers increased to 1.7 million, signifying an increase of 10.7% from 1994 - 1995.[2]

In Indonesia in 2005 visits to EDs of all hospitals was recorded as being 3.6 million, out of 30 million admissions in all hospitals. Among

these cases presenting to EDs, 1.7 million (46.5%) were treated, 51,000 (1.4%) referred, and 1.9 million (51.5%) discharged. The mortality in Indonesian EDs was up to 0.6%.[3] In the whole Jakarta area the number of ED visits was 154, 810 or 5.9% of all hospital admissions (2.6 million). The number of ED patient deaths in Jakarta was 1% in 2005.[3] In the United States 34% of visits to EDs was classified as requiring treatment within 15 minutes, and only 10% was classified as non-urgent cases.[4]

The demand of patients for quality health service has steadily increased, particularly in EDs, which are the service gateway of a hospital. The problems in EDs are very complex. The large number of concurrent visits to EDs has resulted in overcrowding of EDs. Overcrowding in EDs occur when the demand for services exceeds ED capacity to provide quality care in the appropriate time frame. This situation results in patients not being correctly treated, causing them ultimately to voice their complaints. In Canada overcrowded EDs have led to errors and delays in therapy, patient dissatisfaction, loss of control on the staff and prolonged waiting time.[5]

The ED of Private Hospital X has adopted the quality management system of the International Organization for Standardization (ISO). It is essential to ascertain whether the ISO quality management system has indeed improved the quality of ED service by analyzing the factors affecting ED LOS.

Increased number of visits to EDs are accompanied by demands on the ED as the health service gateway, to provide immediate service of professional quality. The ED of Private Hospital X has used triage time and service time of patients as quality objectives of ED service. The objective of this study was to determine the factors influencing LOS in the ED of Private Hospital X.

METHODS

Design of study

This study was performed using a cross-sectional design to determine factors affecting time for achievement of quality objectives in the ED of Private Hospital X.

Location and time of study

This study was conducted in three successive weeks between 1 March 2008 and 21 March 2008 at the ED of Private Hospital X, North Jakarta.

Population and sample

The population in this study comprised all patients presenting to the ED of Private Hospital X in North Jakarta. Sampling was done by means of sample blocks within three successive weeks in March 2008. The number of samples taken was minimally consistent with the size of the sample or the number of samples obtained during the study period. Inclusion criteria were patients presenting for treatment to the ED of Private Hospital X who required hospitalization and had to receive an intravenous fluid drip (IVFD).

Data collection

The collected data comprised times for achievement of quality objectives, including service times of nurses and physicians, and patient data in the category referrals and triage. Characteristics of age, gender, length of employment, and training of nurses and physicians were also collected. Data were collected on morning, evening and night shifts by observers who had been given a short training course on data collection methods.

Measurements

The total duration of patient service or LOS is the time needed by the patient from arrival

until discharge from ED. Service time was one of the indicators of the quality of ED health service. Triage divided patients into two categories on the basis of their emergency status.

Statistical analysis

The collected data were processed by the data-processing software program Statistical Package for Social Science (SPSS). Univariate and bivariate analyses were conducted to achieve the objectives of the study. The statistical tests used were ANOVA (analysis of variance) and independent t-test, with a level of significance of 0.05.

RESULTS

One hundred and seventy one patients were recruited for the study, ranging in age from 15 to 95 years. The mean total duration of service (mean ED LOS) in the ED of Private Hospital was 50 ± 20.7 minutes, with a minimum duration of 15 minutes and a maximum of 134 minutes. If the standard of total duration of ED service taken to be 60 minutes, then the mean total duration of patient service in the ED is already substandard. Around 73.1% of patients had a total duration of service of less than 60 minutes, while the remaining 26.9% had a total duration of more than 60 minutes.

Younger patient tended to obtain quicker service compared with older patients. Mean total duration of service for patients aged below 21 years was 38 minutes, while that for patients aged 65 years and over was 60 minutes. These values show that total duration of patient service tended to lengthen with increasing age of the patient. The difference in total duration of ED service based on patients' age was statistically significant (p=0.001) (Table 1).

Out of 171 patients, 41.5% (71 patients) came to the ED with a letter of referral, while 58.5% (100 patients) did not. Among the patients bringing a letter of referral, the mean ED service time was 43.6 minutes, whereas in those without a letter of referral the mean ED service time was 55.1 minutes (Table 1). Therefore it is apparent that patients without letter of referral had a significantly longer total duration of service in the ED of Private Hospital X, compared to patients with a letter of referral (p=0.001).

Table 1. Mean duration of patient service based on age, referral and triage in the ED of Private Hospital X

Patient's characteristic	n (171)	Mean duration of service (min)	SD	p
Age (yr)				
< 21	37	38.0	15.3	0.001
21 – 30	32	46.8	18.6	
31 – 50	39	53.0	21.6	
51 – 60	26	53.7	20.4	
> 60	37	60.4	20.6	
Letter of referral				
Yes	71	43.6	20.2	0.001
No	100	55.1	19.8	
Triase				
Emergency	33	67.2	23.7	0.001
No	138	46.3	17.8	

Among the 171 patients, 19.3% (33 patients) were emergency cases and 80.7% (138 patients) were not. For patients with emergency status, mean total duration of service was 67.2 minutes and for those without emergency status, mean total duration of service was 46.3 minutes (Table 1). The patients with emergency status had a significantly longer total duration of service total compared with those without (p=0.001).

Duration of patient service by physicians' characteristics

The duration of service by a physician is the total response time of the physician and the time of examination of the patient by the physician. Mean duration of patient service by physicians was 12.9 minutes, with a minimum duration of 2 minutes and a maximum of 65 minutes. In 57.3% of cases, the duration of service by physicians was ≤ 10 minutes and in 42.7% it was > 10 minutes.

Mean duration of service by physicians in the age group of ≤ 35 years was 14.0 minutes, which was longer compared with 11.9 minutes by physicians in the age group of ≥ 36 years (Table 2). However, the difference in mean total duration of service by doctros was not statistically significant (p=0.221).

The same result was obtained for mean duration of service by physicians in the ED of Private Hospital X, based on the gender of the physicians. Based on Table 2, male physicians have a shorter mean duration of service in the ED of Private Hospital X, compared with female physicians, but the difference was not statistically significant (p=0.827).

Table 2. Mean duration of patient service by physicians' characteristic in the ED of Private Hospital X

Physician's characteristics	n (171)	Mean duaration of service (min)	SD	p
Age (yr)				0.221
≤ 35	82	14.0	12.5	
≥ 36	89	11.9	9.1	
Gender				0.827
Male	119	12.8	9.5	
Female	52	13.2	13.7	
Length of employment (yr)				0.490
< 4	85	13.9	12.7	
4-6	53	11.9	8.6	
> 6	33	11.9	9.1	
PPGD*				0.312
Yes	142	13.3	7.0	
No	29	11.1	11.5	
ATLS**				0.959
Yes	123	13.0	10.8	
No	48	12.9	11.0	
ECG***				0.067
Yes	104	14.8	13.2	
No	67	11.7	8.9	

PPGD* : *Penanggulangan Penderita Gawat Darurat* (PPGD)/Management of Emergency Patients
ATLS** : Advance Life Support Training
ECG*** : Electro Cardio Gram

From Table 2 it is apparent that there is no difference in mean total duration of patient service based on length of employment as a physician (p=0.490). This indicates that the duration of service by physicians in the ED of Private Hospital X has been standardized in spite of differences in length of employment.

Among the physicians who had followed training for management of emergency patients *Penanggulangan Penderita Gawat Darurat* (PPGD), the mean duration of patient service was 13.3 minutes, which was longer compared with physicians without PPGD training, who had a mean duration of 11.1 minutes. However, the difference was statistically not significant (p=0.312).

Similarly, for physicians who had training for Advance Trauma Life Support (ATLS), the mean duration of patient service was 12.9 minutes, practically identical to that of physicians without ATLS training, whose mean duration was 13.0 minutes. Additionally, the physicians who had ECG training, has a mean duration of patient service of 11.7 minutes, less than the mean duration of 14.8 minutes for physicians without ECG training.

Duration of patient service by characteristics of nurses

The duration of patient service by nurses in the ED is the nurse's response time for examination of vital signs of patients by the nurse and length of time needed by the nurse in setting up an IVFD. Mean duration of patient service was 14.7 minutes, with a minimum of 8 minutes and a maximum of 30 minutes. In around 66.1% of cases, the duration of patient service was ≤ 10 minutes and in 33.9% it was > 10 minutes.

Table 3. Mean duration of patient service by nurse's characteristic in the ED of Private Hospital X

Nurse's characteristics	n (171)	Mean duration of service (min)	SD	p
Age (yr)				
≤ 25	45	14.1	3.1	0.785
26 – 30	58	14.9	5.0	
31 – 35	44	15.0	5.2	
≤ 36	24	15,0	4.2	
Gender				
Male	68	14.6	4.8	0.713
Female	103	14.8	4.3	
Length of employment (yr)				
≤ 7	135	15.0	4.6	0.117
> 7	36	13.7	4.1	
PPGD*				
Yes	19	14.7	3.3	0.976
No	152	14.7	4.6	
ACLS**				
Yes	117	13.8	3.0	0.067
No	54	15.2	5.0	

PPGD* : *Penanggulangan Penderita Gawat Darurat* (PPGD)/Management of Emergency Patients
ACLS** : Advance Cardiac Life Support

The mean duration of patient service by nurses aged 25 years or below was 14.1 minutes, which was shorter compared with nurses in the 26-30 year age group, whose mean duration of service was 14.9 minutes, and with nurses older than 30 years, with a mean duration of 15 minutes (Table 3). However, the difference was statistically not significant (p=0.785). The mean duration of patient service by female nurses was 14.8 minutes, equal to that of male nurses, with a mean of 14.6 minutes, but the difference was statistically not significant (p=0.713).

Mean duration of patient service by nurses with length of service of 7 years or less was 15.0 minutes, while for nurses with length of service of more than 7 years it was 13.7 minutes (Table 3). This indicates that nurses with a long period of employment had a shorter mean duration of service, but the difference was statistically not significant (p=0.117).

Among nurses who had PPGD training, the mean duration of patient service was 14.7 minutes, equal to that of nurses without PPGD training, with mean duration of 14.7 minutes. Among nurses who had advances cardiac life support (ACLS) training the mean duration of patient service was 15.2 minutes, which was longer than the mean duration of 13.8 minutes among nurses without ACLS training, but the difference was statistically not significant (p=0.067).

DISCUSSION

This study demonstrates that the utility of time studies in identifying and quantifying factors that prolong ED LOS. The study obtained a mean duration of patient service in the ED of 50 minutes, while the minimum was 15 minutes and the maximum 134 minutes. This means that since the arrival of the patient until his/her discharge from the ED, a time period of 50 minutes was required. Thus it is apparent that in 73.1% of cases the patient service time in the ED was less than 60 minutes, but around 26.9% of cases still required more than 60 minutes.

Data of activities in the ED of RSUD Bantul (Bantul General Hospital) indicate that management of medical emergencies in the ED requires a mean time period of 30 minutes, or 15 minutes above standard quality of service based on emergency response time rate.[6] However, the results of the present study differs from studies conducted in three metropolitan hospitals in Melbourne, which showed that the overall mean of ED LOS was 7.96 hours.[7] The Melbourne studies had more prolonged ED LOS, because the patients arriving at the EDs were patients requiring hospitalization.

The National Hospital Ambulatory Medical Care Survey (NHAMCS) obtained a mean LOS of 167.4 minutes for outpatients, while for hospitalized patients the mean time period required was 364.4 minutes.[8] A study by Gardner showed that the median LOS for hospitalized patients was 255 minutes and for outpatients 210 minutes.[9]

The results of the present study showed that mean duration of ED patient care in Private Hospital X was already below the quality objective of the ED of Private Hosital X of 60 minutes. However, closer examination revealed a difference in mean patient care based on patient's age, letter of referral, and level of emergency/triage of the patient. Younger patients tended to have a shorter duration of ED service compared with older patients. The mean duration of service was 38 minutes for patients below 21 years, and tended to increase with patient's age, reaching 60 minutes in patients over 65 years old. The difference in duration of ED service based on patient's age was statistically significant.

These results are similar to those of studies in Canada, where annually more than one million Canadians are hospitalized through the

ED. The Canadian patients tended be elderly persons suffering from various severe conditions and on average had longer hospital stays than other inpatients.[10] The Centers for Disease Control and Prevention (CDC) reported an increase in ED visits by adults, especially those aged 65 years and over.[11] A study in U.K.showed that the proportion of patients requiring ED LOS of more than 4 hours was 39.0% and belonged to the age group of >85 years.[12]

From the results of this study it may be concluded that patients without a letter of referral have longer service times compared with patients having a letter of referral. This was probably due to the physician on duty being able to focus on administration of therapy, because in the letter of referral the patient's identity, diagnosis and therapy had already been specified. Patients with emergency status had a longer duration of service compared with patients without emergency status. These results are similar to those of Canadian studies stating that ED LOS depends on the severity of the patient's illness. Data from 2003-2004 in Canada showed that patients with more severe disease stayed longer in the ED compared with patients with milder disease. ED LOS resulting from triage indicates that patients with Canadian Triage and Aculty Scale (CTAS) I (requiring resuscitation/emergency care) had a median LOS of 161 minutes compared with the median for CTAS V (non-emergency) of 67 minutes. This difference shows that the more complex a patient's health problem, the larger the number of diagnostic tests required and the longer the observation time, compared with conditions that can be managed by the ED physicians themselves. It was also proved that the median LOS increases with advanced age. The increased LOS in ED patients with more severe illness has also been reported in Australia in 2003-2004. Patient who underwent emergency triage had a LOS of more than 3 hours (195 minutes) compared with those undergoing non-emergency triage, with a LOS of 75 minutes.[13] This study showed that the duration of patient service by ED physicians is 12.9 minutes. Research in Canada has shown that the service time of their physicians is 3-4 patients per hour.[14] The study by Millar indicates that mean service time of ED physicians is 17.9 minutes.[15] Studies in the ED of RSUD Bantul show that mean medical emergency handling time is 12.51 minutes, with most frequent mean handling time of 10 minutes. These results indicate that handling of emergencies was not delayed and could prevent deaths in up to 30% of emergency cases.[6]

Canadian studies have associated total service time of ED physicians per patient visit with gender, age, vital signs and Glasgow Coma Scale (GCS), mode of arrival at ED, triage level, accompanying diseases of patient and hospital working procedures, demonstrating that the most important predictors influencing service time of physicians are working procedure, triage level, arrival by ambulance, GCS, patient's age, accompanying disease and number of visit priorities.[16]

Service time of patients by ED nurses in Private Hospital X is 14.7 minutes. Studies in New Zealand yielded mean patient service time by nurses of 49 minutes per visit. On average, patients with an emergency triage code had longer ED LOS, meaning that non-ambulatory patients take up more of the nurse's time.[17] Research in America has demonstrated that the most critically ill or injured patients get a quicker response from nurses and physicians, although with varying lengths of time, but the overall of service rate by nurses was up to 80%.[18] The results of studies on Canadian nurses indicate that nurses take care of between 1-2 patients per hour.[5]

The results of this study show that the significant factors influencing service time of

ED patients are patient category, physicians' charracteristics and nurses characteristics. Patient category (as independent variable) includes age, presence or absence of referral letter, and level of emergency or triage of patient. Nurses' characteristics (as independent variable) include age, length of service and ACLS training, while physicians' category (as independent variable) includes EKG training.

The current study results are consistent with studies in America stating that the factors influencing ED LOS (Emergency Departement Length of Stay) from the study sample included patient's age, patient's diagnosis, consultation, multiple radiological examinations, delays in admission (hospitalization), nurses being occupied, family members staying at bedside, observation of patient, patient requiring stabilization, beds not ready (not made), and patient receiving IVFD. There was no significant ED LOS factor noted as being the result of initial examination by the physician.[19]

Limitations of the study

A major limitation of this study was that the study was cross-sectional and not prospective. This investigation failed to delineate causal relationships between predictor variables and LOS. ED processes are interdependent and subject to external influences; therefore, improvement in one area may not shorten LOS, and meaningful change may involve adjusting a combination of many factors, the identification of which may be difficult.

A final concern is that the generalizability of our findings may be limited because sociodemographic factors, ED work processes, ED management structures, availability of specialty consultation and inpatient services all vary across sites and would be expected to influence ED LOS.

CONCLUSIONS

Emergency department LOS was associated with elderly status, letter of referral, patient triage, physician's and nurse's characteristics. Strategies for reducing ED LOS, which presumably will lead to ED cost-savings, should target elderly patients. Importantly, they may also prevent patient morbidity and mortality.

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