Profile of Patients Hospitalized through the Emergency Room to the Medicine Ward and their Short-term Outcome at a Tertiary Care Hospital in Delhi

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Abstract

Introduction: With an increasing number of sicker patients, limited hospital beds, and an emphasis on day care, the profile of patients hospitalized to medicine wards has undergone a radical re-definition. The increasing share of patients hospitalized through the emergency department for acute care to medicine wards has left little space for hospitalization through the outpatient department (OPD). There are some global data available on the profile of patients presenting to the emergency rooms (ERs) and their subsequent outcome. Data from developing countries, especially India, in this regard are lacking.

Methods: This cross-sectional study included all patients hospitalized to the medicine ward through the medical emergency services, provided by the Department of Medicine, each Wednesday and every sixth Sunday for the entire year (a total of 62 days), from November 2010 through October 2011, and followed their outcome up to seven days after hospitalization.

Results: Of the 3,618 cases presenting to medicine emergency on these days, 1,547 (42.3%) were advised admission. Nine hundred sixty-seven reported to the medicine wards. One hundred eleven (7.73%) expired within 24 hours; others absconded, were lost in transit, did not consent to participation, or were discharged. During the next seven days, 452 (46.7%) recovered sufficiently and were discharged to go home. Two hundred thirty (23.8%) left the hospital without informing the medical staff. Fourteen (1.4%) patients were transferred to other departments. One hundred thirty-seven (8.8%) patients died during the next six days of hospitalization. After Multivariate Logistic Regression analysis, abnormal Glasgow Coma Scale (GCS) score, high systolic blood pressure (BP), age, increased total leucocyte count, increased globulin, low bicarbonate in arterial blood, low Mini Mental Status Examination (MMSE) score, and a raised urea >40 mg/dL were found to be associated significantly with mortality.

Conclusion: Of the 1,547 patients who needed urgent hospitalization, 248 (16%) died within the first week, one-half of them within the first 24 hours. An advanced age, abnormal GCS score, low MMSE score, increased systolic BP, leukocytosis, acidosis, and uremia were found to be associated with a fatal outcome. Therefore, nearly one-half of the patients who would have a fatal short-term outcome were likely to do so within the first 24 hours, making the first day of presentation "the golden day" period.

Introduction

Emergencies and accidents are common in developing countries; however, most hospitals in developing countries lack separate Emergency Medicine departments. In India, emergency care is offered by hospitals in both the public and the private sector.[1] Academic and non-teaching centers, dispensaries, and smaller hospitals that constitute the public sector often lack trained staff, adequate infrastructure, and a reliable supply of consumables.[2]

Typically, most emergency care is provided in areas demarcated as casualty, emergency, or accident rooms. Formal education and specialty training in emergency management are neither universally available nor mandatory for physicians and personnel involved in casualty/accident room care.[3] Usually, fresh graduates are posted in these rooms, often on rotation from various specialties, and they have little knowledge about practical patient management.[3] Doctors often function as patient traffic controllers who redirect victims arriving in the emergency room (ER) to the respective specialties for management. Ironically, this system leaves the least experienced professionals to treat the most seriously ill and severely injured patient. Usually, different teams from the respective clinical departments often manage the emergency areas on pre-scheduled days of the week. The team on any given day admits and observes patients in the ER and then shifts their patients to respective wards at the end of 24 hours. This system is unlike that in developed countries where a separate team manages patients in the ER and then the patients are handed over to another team managing the medical floors.

The resource allocation in these emergency areas is poor and there is a lack of studies analyzing the profile of patients presenting to medicine ERs, thereby leading to a poor resource management and trained staff deployment. The present study aimed to determine the profile of patients admitted to the medicine wards through the medicine ER and their seven day outcome.

Methodology
Study Design, Setting, and Period
The study was conducted in a large tertiary care teaching hospital in North East Delhi and was approved by the Institutional Ethics Committee of University College of Medical Sciences (the affiliated teaching medical college; New Delhi, India). Being the largest tertiary care center in this area, they cater to the health care needs of eastern parts of Delhi and western parts of the state of Uttar Pradesh. There are six medical units under the Department of Medicine at this hospital, and each unit attends to the patients presenting to the ER by rotation for one day every week and on every sixth Sunday. All patients hospitalized to the medicine ward through the medical emergency services each Wednesday and every sixth Sunday (ie, admission days of a particular unit) were prospectively included and followed for a period of seven days to determine their short-term outcome. Those participants who were found dead on arrival to the hospital were excluded.

The health care workers involved in care of patients in the ER and medicine wards were mostly the first, second, and third year residents of the Department of Medicine, interns (medical students in their fifth year of medical college who rotated through the department), and Registered Nurses, with daily rounds by the attending physician. The resources available at the emergency level (where the patients were initially kept for 24 hours) before being transferred to the general medicine floors included: laboratory services, radiology services, monitored beds (four out of 28 beds with cardiac monitor support and ventilator facility), and a nurse to patient ratio of 1:6. However, some patients requiring emergency intubation in the ER (when no intensive care unit beds were available and the ventilator beds were exhausted in the ER) were maintained on manual ambu bag ventilation until a ventilator machine became available. Moreover, patients on ventilators were not transferred to the floor; however, patients on manual ambu ventilation were transferred to the floor. For the medical floors, the facilities available included: laboratory support, imaging, no

monitored beds, and a nurse to patient ratio of 1:15. The outcome was terminated at seven days because it was not logistically feasible for the research team to follow up with patients for more than seven days.

Data Collection and Management
After taking written and informed consent from the patients, or their nearest relatives, details of the marital status, living arrangements, vehicles used for transportation, availability of insurance, and socio-economic status as determined by the modified Kuppuswami Scale were compiled.[4] Presenting complaints, personal details, and medication history were recorded. The level of consciousness was measured using the Glasgow Coma Scale (GCS) score and the functional status was determined using Barthel's Activities of Daily Living (ADL) score.[5-7] The mental functions were determined using the Mini Mental Status Examination (MMSE). These patients were followed until the seventh day of hospitalization and outcome was determined as: (a) discharged; (b) left against medical advice (LAMA); (c) absconded; (d) transferred; (e) died; or (f) continued hospitalization. Patients who LAMA were defined when a patient insisted upon leaving against the expressed advice of the treating team and left after informing the team. Absconded was when the patient left the hospital without notification by escaping.

Data Analysis
Data were analyzed using SPSS version 17.0 (SPSS Inc; Chicago, Illinois USA). Frequency distribution was studied for qualitative variables and mean with standard deviation was calculated for quantitative variables. Variables were compared between the patients who died as the comparison group and the patients who survived on day seven as the baseline group. Chi square test was used to compare categorical variables while Student's t-test was used to compare the continuous nominal variables. Mann-Whitney U test was used to compare the non-parametric variables between these groups. Regression analysis was used to determine association of independent variables with poor outcome defined by death within seven days of hospitalization.

Results
Patient Volume and Patient Flow
A total of 3,618 patients presented to the medical emergency services run by the Department of Medicine over 61 emergency days, spread over one year, from November 2010 through October 2011. Of these, 1,547 (42.7%) patients were advised hospitalization to the medicine ward, whereas the remaining (57.3%) were administered initial management, and following improvement, were advised to follow up in the outpatient department (OPD) for further evaluation. Of these, 967 (62.5%) reported to the medicine wards. One hundred eleven (7.2%) had expired within the first 24 hours; others absconded, were lost in transit, did not consent to participation, or were discharged early. The flow of patients in the study is presented in Figure 1.

Demographic Profile of Patients and Delay in Presentation
The mean age of the patients was 42.4 years (SD = 19.1 years) with most (183; 18.9%) patients in the age group of 21-30 years. The profile of patients is presented in Table 1. As many as 733 (75.8%) patients reached the hospital after a variable period of delay. The main reason of delay (482; 65.8%) was the belief that symptoms were mild and would subside on their own. Two hundred eighteen
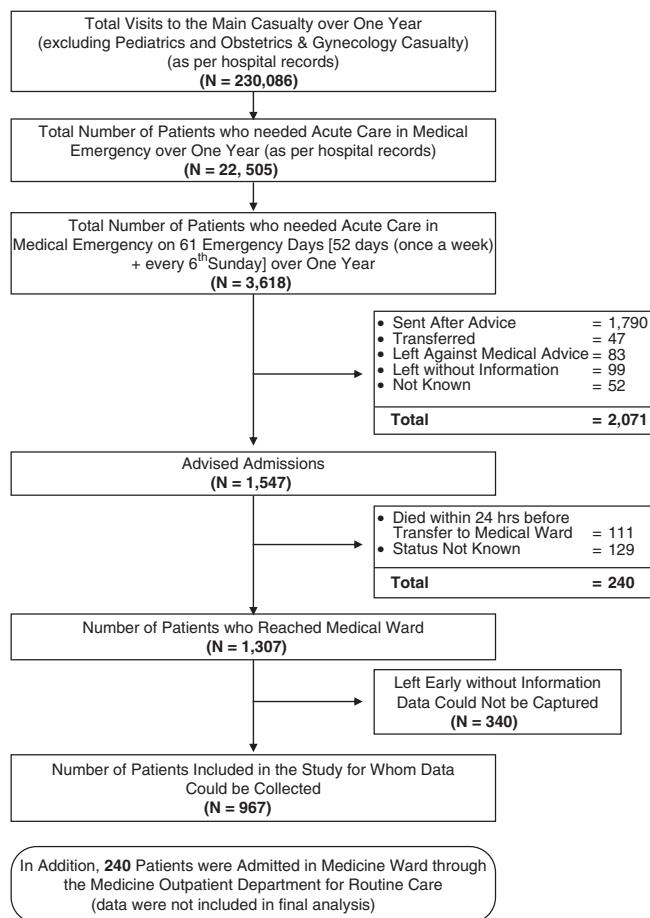
Figure 1. Schematic Diagram Showing Flow of Patients being Admitted to the Medicine Wards after Presenting to the Main Casualty.

Outcome	No. (%)
Discharged	452 (46.7)
Left Against Medical Advice	143 (14.8)
Absconded	87 (9.0)
Transferred	14 (1.4)
Died	137 (14.2)
Continued Hospitalization beyond Day 7	134 (13.9)

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Table 1. Outcome of the Hospitalized Patients on Day Seven (N = 967)

(29.7%) patients did seek treatment from a local doctor and presented when this treatment failed to provide relief.

Clinical Profile
Most patients presented with infections (368; 38.0%) and multiple co-morbidities (191; 19.8%). Malaria (119; 32.3%), dengue (56; 15%), and tuberculosis (70; 19.02%) were the major infections among the studied patients. One hundred thirty-nine (14.4%) patients were hypertensive, 106 (11.0%) had coronary artery disease, 93 (9.6 %) were diabetic, 93 (9.6%) had cerebrovascular accidents (CVAs), 57 (5.9%) had chronic kidney disease, and 43 (4.4%) had chronic obstructive pulmonary disease. The median for GCS was 15.00, Barthel's ADL Index score was 11.00, and MMSE score was 25.00.

Patient Outcome
Of the 967 patients hospitalized to the medicine ward through the ER, 452 (46.7%) recovered sufficiently over one week and were discharged from the hospital to go home. Two hundred thirty (23.8%) left the hospital without informing the medical staff or LAMA. Fourteen (1.4%) patients were transferred to other departments within or outside the hospital. Among all patients who were advised hospitalization (1,547), 111 (7.2%) expired during the first 24 hours and 137 (8.8%) patients died during next six days of hospitalization. The distribution of the outcome of patients is shown in Table 2. Most common diagnoses associated with a fatal outcome were infectious diseases such as complicated malaria (19; 13.8%), tuberculosis (17; 12.4%), and lower respiratory tract infections (12; 8.7%); CVAs (17; 12.4%) and chronic obstructive pulmonary disease (11; 8.0%) were the other important causes of poor outcome.

Bradycardia (pulse < 60/min), tachycardia (pulse > 100/min), systolic blood pressure (BP) (<90 mm Hg and >140 mm Hg), GCS score (<14), low MMSE score (<24), deranged ADL score (<20), leucopenia (<4,000/cmm), leukocytosis (>10,000/cmm), hypoglycemia, hyperglycemia, blood urea (>40 mg/dL), hyponatremia (<130 mEq/L), hypernatremia (>140 mEq/L), hypokalemia (<3 mEq/L), and hyperkalemia (>4 mEq/L) were found to be associated with increased mortality. Coronary artery disease and CVAs were the most common diagnoses associated with poor outcome. Details of factors associated with a poor outcome are presented in Table 3.

After multivariate logistic regression analysis, abnormal GCS score, high systolic BP, age, leukocytosis, increased globulin levels, metabolic acidosis, low MMSE score, and azotemia were found to be associated significantly with mortality.

Discussion
Demographic Profile of Patients
In this study, 967 patients who were hospitalized to the medicine ward through the ER were studied. The demographic profile of patients in the study is representative of the population profile that is catered to and may act as a rough guide towards more effective extrapolation of the findings to similar patient groups. It was noted that more men visited the ER than women with emergency presentations. While this was surprising given the poorer health condition of women in India, it might reflect that women were less likely to seek emergency health care, due likely to the social milieu whereby women are dependent upon their male counterparts for seeking health care.

Prehospital Care, Patient Referral, and Health-seeking Behavior
In this study, few (7.4%) patients carried a formal referral slip indicating that tertiary care is a misnomer and centers are functioning as points of first contact, especially in emergency situations, reflecting on a less-developed and often neglected sector of primary care. This causes strain and burden on the so-called "tertiary" health care systems.

Indicator Parameter	No. of Deaths among Patients with Indicator (%)	Total Patients with Indicator	No. of Deaths among Patients without Indicator (%)	Total Patients without Indicator	P Value
Bradycardia (Pulse < 60/min)[a]	2 (25.0)	8	62 (11.6)	553	.015
Tachycardia (Pulse > 100/min)[a]	56 (18.6)	301	62 (11.6)	553	.015
Hypotension (SBP < 90 mm Hg)[a]	22 (24.2)	91	82 (12.8)	639	.014
Hypertension (SBP > 140 mm Hg)[a]	20 (13.2)	152	82 (12.8)	639	.014
Glasgow Coma Scale (GCS < 14)[b]	92 (40.4)	228	45 (6.1)	738	<.001
Deranged ADL (ADL < 20)[b]	137 (16.0)	856	0 (0.0)	111	<.001
Low MMSE (MMSE < 24/30)[b]	124 (27.7)	447	13 (2.5)	519	<.001
Leukopenia (<4000/mm^3)[b]	9 (8.3)	108	42 (9.4)	445	<.001
Leukocytosis (>11000/mm^3)[b]	68 (23.5)	289	42 (9.4)	445	<.001
Hypoglycemia (<70 mg/dL)[a]	14 (19.4)	72	29 (12.1)	239	.026
Hyperglycemia (>200 mg/dL)[a]	26 (23.0)	113	29 (12.1)	239	.026
Blood Urea(>40 mg/dL)[b]	61 (20.0)	305	49 (10.8)	452	<.001
Hyponatremia (Na < 130 mEq/L)[c]	25 (26.0)	96	46 (12.6)	365	.003
Hypernatremia (Na > 140 mEq/L)[c]	43 (13.2)	326	46 (12.6)	365	.003
Hypokalemia (K <3 mEq/L)[c]	9 (24.3)	37	62 (11.7)	528	.005
Hyperkalemia (K > 4 mEq/L)[c]	43 (19.5)	221	62 (11.7)	528	.005
Coronary Artery Disease[c]	6 (5.7)	106	131 (15.2)	861	.003
CVA[c]	21 (25.9)	81	116 (13.1)	886	.002

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Table 2. Parameters Associated with Mortality among Patients Hospitalized to the Medicine Ward. The table indicates parameters found to have a significant association with mortality among the patients hospitalized to the Medical Ward through the emergency room. The results indicate the significance levels as obtained after Chi Square test.
Abbreviations: ADL, Activities of Daily Living; CVA, cerebrovascular accident; GCS, Glasgow Coma Scale; MMSE, Mini Mental Status Examination; KSES, Kuppuswamy Socio Economic Scale.
[a] Indicates P value <.05.
[b] Indicates P value <.001.
[c] Indicates P value <.01.

Distance of patient residence from the hospital is associated with the frequency of use of emergency services.[8,9] Not surprisingly, those living closest to the hospital are likely to visit in emergency situations. In this study, 641 (66.2%) patients resided within a radius of 10 kilometers from the hospital and 733 (75.8%) patients reached the hospital after a variable period of delay

	Mean among Patients with Fatal Outcome (SD)	Mean/Median among Patients who Survived (SD)	P Value
SBP(mm Hg)[a]	111.2 (31.7)	117.1 (31.3)	.05
Age (years)[b]	47.39 (20.0)	41.67 (18.8)	.001
Serum Protein (g/dL)[a]	5.7 (1.4)	6.4 (1.2)	.042
Serum Globulin (g/dL)[c]	2.1 (0.15)	3.0 (0.7)	<.001
Serum Bicarbonate (mEq/L)[a]	23.1 (4.3)	17.5 (6.4)	.048
TLC (/mm^3)[c]	13,692 (8,981)	9,506 (6,559)	<.001

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Table 3. Parameters Significantly Associated with Mortality among the Patients Hospitalized to the Medical Ward. The table indicates parameters found to have a significant association with mortality among the patients hospitalized to the Medical Ward through the emergency room. The results indicate the significance levels as obtained after comparison of means between two independent samples using *t*-test.
Abbreviations: SBP, systolic blood pressure; TLC, total leukocyte count.
[a] Indicates P value <.05.
[b] Indicates P value <.01.
[c] Indicates P value <.001.

following the onset of symptoms. The delay in arrival of patients to the ER and in initiation of treatment after arrival has previously been studied in context of stroke and myocardial infarction.[10,11] Delay is usually due to ignorance of symptoms, or unavailability of transport facilities, and results in deviation from standard protocols and guidelines leading to a poorer outcome. Only 32 (3.3%) patients reached the hospital using commercially available ambulance services. However, it is important to note that most available ambulances in the area are usually makeshift vehicles which carry a rudimentary oxygen cylinder with a stretcher, without an accompanying doctor, besides having little or no space for the performance of any resuscitation procedure. It is also noted with interest that 619 (64.0%) patients had been transported to the hospital in low-cost, three-wheeled, manual or motorized vehicles due to the ease of availability, familiarity, and maneuverability through chaotic traffic, to hospitals frequently located away from the arterial roads, with a resultant delay in presentation.

Five hundred twenty-one (53.9%) patients presented during the night shift (9:00 PM-9:00 AM) and only 82 (8.5%) patients presented during the morning shift (9:00 AM-2:00 PM). Lower hospitalization rate in the morning shift reflects the parallel functioning of the OPD. It is prudent to deploy staff during morning hours to areas of hospitals that have higher work pressure.

Social and Clinical Profile of Patients
Socio-economic status of the patients in a hospital closely resembles and reflects the general population in the geographical service area of the hospital.[12] In this study, a large number of patients (412; 42.6%) were in the lower or in the upper-lower socio-economic class, and only one-fourth (251; 26.0%) were financially independent. Only 12 were insured either by government health scheme or by private companies.

In this study, many patients had infectious diseases (368; 38.0%) and several had multiple co-morbidities (191, 19.8%). In a retrospective case-based analysis, Chattoraj et al in Delhi had previously shown that about 45.0% of admitted patients had respiratory disorders and the top two ailments were chronic

obstructive lung disease and tuberculosis, and co-morbidities such as hypertension and diabetes were common.[13]

Outcome of Patients
In this study, 454 (46.9%) patients recovered and were discharged within the first week, 143 (14.8%) patients LAMA, and 87 (9.0%) absconded. One hundred thirty-four (13.8%) patients needed hospitalization beyond the first week; 137 (14.2%) patients expired within the first week of hospitalization. In addition, 111 (11.4%) patients had expired within the first 24 hours of presentation in the ER.

It was found that advancing age, bradycardia, tachycardia, hypotension, hypertension, low GCS score, low MMSE score, deranged ADL score, leucopenia, leukocytosis, hypoglycemia, hyperglycemia, azotemia, hyponatremia, hypernatremia, hypokalemia, and hyperkalemia were associated with increased all-cause mortality in the hospital within the first seven days of hospitalization.

Goodacre et al reported that age, active malignancy, GCS score, respiratory rate, peripheral oxygen saturation, temperature, white cell count, serum potassium, and blood urea concentrations were independent predictors of seven day mortality.[14] Hypotension, hypoalbuminemia, malnutrition, delirium, and dependency have previously been found to be associated with mortality by different authors.[15-17] Higher mortality rates have also been reported in patients presenting to ER with seizures, intoxication, breathlessness, malignancy, sepsis, hypoglycemia, and hyperglycemia.[18-21]

Increasing leukocyte count, even within the normal range, has been associated with increased mortality.[22,23] Hyponatremia at presentation has a complicated relationship with the risk of in-hospital mortality and it has been shown that early resolution attenuates the increased risk it presents.[24-26] Patients with hyponatremia are older and have severe underlying disease, besides other co-morbid conditions, which complicate illness.

These factors reflect the need to clinically examine, investigate, and document these factors at the time of admission, and during the hospital stay, so that patients can be stratified into groups

based on prognosis and more intensive care, with close monitoring given to the patients with these factors to improve outcome.

Strengths

This study provides a comprehensive record of the changing characteristics of the patients hospitalized to the medicine wards in a tertiary care teaching hospital. The patients were included over a period of a year, and hence took into consideration the seasonal variations in the disease presentation. Moreover, the study was done both on the weekdays and weekends, therefore balancing out the variations in patient profile and seasonal disease variation.

Further, several parameters for short-term prognosis were studied in a prospective manner. This study highlights the bearing of socio-demographic factors on health care seeking behavior and serves to emphasize the increasing patient attendance at public hospitals which calls for radical reforms and rational resource allocation.

Limitations

Several patients who were advised hospitalization did not report to the medicine ward from the ER. This may be due to the desire to take the patients home where a poor outcome was anticipated, an unstable family condition to financially support the patient, a conflict within the family or with the health care staff, or dissatisfaction with the hospital services. It would have been important and interesting not only to know the outcome of these patients, but also to pinpoint what prompted them to leave without informing the medical staff since this is a ground reality that many public hospitals in developing countries need to deal with. This study was also unable to follow the outcome of patients who stayed with the treatment team, seven days post-admission, and it would have made more sense to know the outcome in these cases.

Conclusions

In a prospective study of patients hospitalized to the medicine wards through the ER, it was noted that a significant number of subjects either leave the hospital against medical advice or succumb to their illness within the first week. Advanced age, low GCS or MMSE score, hypotension, leukocytosis, metabolic acidosis, and azotemia are associated with a poor outcome. Nearly one-half of the patients who have a fatal short-term outcome are likely to do so within the first 24 hours, thus making the first day of presentation "the golden day" period for focused management with help of a robust, scientific, and synchronized emergency.

References

1. Schuur JD, Venkatesh AK. The growing role of emergency departments in hospital admissions. *N Engl J Med*. 2012;367(5):391-393.
2. Ramanujam P, Aschkenasy M. Identifying the need for prehospital and emergency care in the developing world: a case study in Chennai, India. *J Assoc Physicians India*. 2007;55:491-495.
3. Alagappan K, Cherukuri K, Narang V, Kwiatkowski T, Rajagopalan A. Early development of emergency medicine in Chennai (Madras), India. *Ann Emerg Med*. 1998;32(5):604-608.
4. Kumar N, Shekhar C, Kumar P, et al. Kuppuswamy's socioeconomic status scale-updating for 2007. *Indian J Pediatr*. 2007;74(12):1131-1132.
5. Rimel RW, Jane JA, Edlich RF. An injury severity scale for comprehensive management of central nervous system trauma. *Jacep*. 1979;8(2):64-67.
6. Teasdale G, Murray G, Parker L, et al. Adding up the Glasgow Coma Score. *Acta Neurochir Suppl (Wien)*. 1979;28(1):13-16.
7. Mahoney FI, Barthel DW. Functional evaluation: the Barthel Index. *Md State Med J*. 1965;14:61-65.
8. Goodacre S, Wilson R, Shephard N, et al. Derivation and validation of a risk adjustment model for predicting seven day mortality in emergency medical admissions: mixed prospective and retrospective cohort study. *Br Med J*. 2012;344:e2904.
9. Henneman PL, Garb JL, Capraro GA, et al. Geography and travel distance impact emergency department visits. *Journal of Emergency Medicine*. 2011;40(3):333-339.
10. Chu GS, Kugathasan U, Myint PK. Delay in the presentation of patients to hospital is the main factor for failure to adhere to the Royal College of Physicians' guidelines in the management of suspected subarachnoid hemorrhage. *Clin Med*. 2006;6(5):511-512.
11. Grossman SA, Brown DF, Chang Y, et al. Predictors of delay in presentation to the ED in patients with suspected acute coronary syndromes. *American Journal of Emergency Medicine*. 2003;21(5):425-428.
12. Walker LL. Inpatient and emergency department utilization: the effect of distance, social class, age, sex, and marital status. *Jacep*. 1976;5(2):105-110.
13. Chattoraj ASS. A study of sickness and admission pattern of patients attending an emergency department in a tertiary care hospital. *J Acad Hosp Adm*. 2006;18(1):1-12.
14. Goodacre S, Turner J, Nicholl J. Prediction of mortality among emergency medical admissions. *Emerg Med J*. 2006;23(5):372-375.
15. Drame M, Jovenin N, Novella JL, et al. Predicting early mortality among elderly patients hospitalized in medical wards via emergency department: the SAFES cohort study. *J Nutr Health Aging*. 2008;12(8):599-604.
16. Jones AE, Yiannibas V, Johnson C, et al. Emergency department hypotension predicts sudden unexpected in-hospital mortality: a prospective cohort study. *Chest*. 2006;130(4): 941-946.
17. Lyons O, Whelan B, Bennett K, et al. Serum albumin as an outcome predictor in hospital emergency medical admissions. *Eur J Intern Med*. 2010;21(1):17-20.
18. Safwenberg U, Terent A, Lind L. The Emergency department presenting complaint as predictor of in-hospital fatality. *Eur J Emerg Med*. 2007;14(6):324-331.
19. Safwenberg U, Terent A, Lind L. Differences in long-term mortality for different emergency department presenting complaints. *Acad Emerg Med*. 2008;15(1):9-16.
20. Gabbanelli V, Pantanetti S, Donati A, et al. Correlation between hyperglycemia and mortality in a medical and surgical intensive care unit. *Minerva Anestesiologica*. 2005; 71(11):717-725.
21. Kagansky N, Levy S, Rimon E, et al. Hypoglycemia as a predictor of mortality in hospitalized elderly patients. *Arch Intern Med*. 2003;163(15):1825-1829.
22. Asadollahi K, Beeching NJ, Gill GV. Leukocytosis as a predictor for non-infective mortality and morbidity. *QJM: An International Journal of Medicine*. 2010;103(5): 285-292.
23. de Labry LO, Campion EW, Glynn RJ, Vokonas PS. White blood cell count as a predictor of mortality: results over 18 years from the Normative Aging Study. *J Clin Epidemiol*. 1990;43(2):153-157.
24. Chawla AS, Sterns RH, Nigwekar SU, Cappuccio JD. Mortality and the serum sodium: do patients die with or from hyponatremia? *Clin J Am Soc Nephrol*. 2011; 6(5):960-965.
25. Mandal AK, Saklayen MG, Hillman NM, et al. Predictive factors for high mortality in hypernatremic patients. *Am J Emerg Med*. 1997;15(2):130-132.
26. Waikar SS, Mount DB, Curhan GC. Mortality after hospitalization with mild, moderate, and severe hyponatremia. *Am J Med*. 2009;122(9):857-865.