A STUDY ON FACTORS AND OUTCOME OF UNSCHEDULED EARLY REVISIT TO EMERGENCY DEPARTMENT OF HOSPITAL USM

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LIST OF ABBREVATIONS

ED	Emergency department
USM	Universiti Sains Malaysia
CI	Confidence interval
OR	Odd ratio
HREC	Human Research Ethics Committee (USM)
SPSS	Statistical Packages for Social Sciences
LR	Likelihood ratio
ROC	Receiver operating curve

ABSTRAK

Pengenalan: Lawatan ulangan tidak berjadual ke jabatan kecemasan (ED) mungkin menambahkan beban kerja kepada petugas kecemasan dan ini merupakan isu yang berpotensi untuk ditambahbaik. Tujuan kajian ini adalah untuk menyelidik dan mengenalpasti faktor-faktor yang berkaitan dengan lawatan ulangan awal tidak berjadual di ED Hospital USM.

Kaedah: Kajian kohort retrospektif telah dijalankan di Hospital USM bermula Januari 2014 sehingga Januari 2015 untuk mengenalpasti demografi pesakit lawatan ulangan awal tidak berjadual ke ED Hospital USM. Kriteria pesakit adalah umur 18 tahun dan ke atas, sertai lawatan ulangan ke ED dalam masa 9 hari selepas lawatan pertama yang tiada dalam pelan semasa discaj.

Keputusan: Sebanyak 492 kes direkodkan. Kadar lawatan ulangan ED tidak dirancang dalam masa 9 hari dari lawatan ED pertama di Hospital USM adalah 0.66% untuk tempoh pengajian. Faktor risiko untuk kedatangan semula termasuk usia, komorbiditi, tempoh masa semasa lawatan pertama ke ED dan ralat dalam sistem penjagaan kesihatan. Manakala faktor-faktor morbiditi yang signifikan adalah diabetes mellitus (OR, 2.07, 95% CI, 1.08-3.96), penyakit pernafasan (OR, 2.42, 95% CI, 1.18-4.98), penyakit gastrousus (OR, 5.93; 95% CI, 1.29 -27.35), penyakit sistem saraf (OR, 4.65; 95% CI, 1.27-17.02), tempoh lebih daripada 6 jam semasa lawatan ED pertama (OR, 3.05; 95% CI, 1.53-6.07), dan kecuaian perubatan yang membawa kepada kemasukan wad (OR, 8.85; 95% CI, 4.43-17.67). Kadar kematian secara keseluruhan adalah 0.2% (1/492).

Kesimpulan: Staf kecemasan perlu lebih berhati-hati apabila merawat pesakit dengan faktor risiko terutamanya faktor risiko yang boleh diubah untuk mengurangkan kes-kes lawatan ulangan tidak berjadual ke ED.

KATA KUNCI: faktor, hasil, lawatan ulangan awal tidak berjadual, jabatan kecemasan

ABSTRACT

Introduction: Unscheduled revisits to the emergency department (ED) may present a considerable additional workload. This study investigated the risk factors contributing to adverse event during unscheduled early revisit to ED Hospital Universiti Sains Malaysia (USM).

Methods: A retrospective cohort study was conducted from January 2014 to January 2015 to character the nature of unscheduled early revisits to ED Hospital USM. It included all patients 18 years old and above, revisited ED within 9 days post discharge from ED.

Results: Data was collected from 492 case records. The rate of ED unplanned revisits within 9 days of previous ED discharge was 0.66% for the study period. Risk factors for revisit included advance age, pre-existing co-morbids, duration spent during first ED visit and health care system related error. The independent predictors of morbidity were diabetes mellitus (OR, 2.07; 95% CI, 1.08-3.96), respiratory disease (OR, 2.42; 95% CI, 1.18-4.98), gastrointestinal disease (OR, 5.93; 95% CI, 1.29-27.35), nervous system disease (OR, 4.65; 95% CI, 1.27-17.02), duration spent more than 6 hours during first ED visit (OR, 3.05; 95% CI, 1.53-6.07), and medical error leading to admission (OR, 8.85; 95% CI, 4.43-17.67). The overall mortality rate was 0.2% (1/492).

Conclusion: ED personnel need to be extra vigilant when managing patients with risk factors particularly the modifiable risk factors to curb ED revisit.

KEYWORDS: emergency department, factors, outcome, unplanned revisit

CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION

Emergency departments (EDs) offer critical medical care, including diagnostic, resuscitation and stabilization. In other words, ED is frequently the initial contact between patients and secondary health care providers. In an ideal ED, disposition is always correct and all likely differential diagnoses are considered for that patient (Schenkel 2000). However, this ideal ED does not really exist. Although doctors, paramedics and other supporting staff work to their best of abilities, mistakes do occur in all parts of medicine for various reasons.

The demand for emergency care in every part of the world has been steadily increasing. Unscheduled revisits to the ED may present a considerable additional workload and it signifies a potential area for care improvement. In keeping with the objectives of emergency medicine service, the rate of early ED revisit is regarded as a quality of care indicator and a tool for improving patient care (Han et al 2015). Many EDs of hospitals in developed countries track revisits. However, the data on unplanned revisits to EDs in Malaysia remains lacking and there is no comprehensive hospital study. A rate of less than 1% had been proposed for this quality care indicator (Nunez et al 2006) while the international data suggested a rate of roughly 3% as a reasonable estimation of the average global unscheduled revisit rate (Triveedy & Cooke 2015). Nevertheless, this standard is not universally accepted. Unplanned revisit rates over a certain limit may indicate poor clinical care, system failures and poor access to alternative primary care services, therefore the underpinning causes should be investigated.

Generally, the use of 72-hour bounceback as the measure of interest for hospital quality metric had no known empirical basis (Pham et al 2011). Moore et al showed that the ED representation clustered around one week after the first visit and fell rapidly thereafter. Rising et al suggested that 9 days should be used as a more inclusive cutoff for studies of ED revisits.

While there are limited publications on investigation of factors associated with ED revisits, previous studies have identified several important factors associated with higher 30 days readmission rates (Rising et al 2015). Understanding factors that are associated with ED reattendances is important as this can lead to targeted interventions of potentially modifiable risk factors. Han et al (2015) identified four categories of precipitating factors that influence early ED revisits, namely patient-related, illness-related, health care system–related and other factors. It is not clear whether any of these factors are actually in the causal pathway of patient returns. Patients who make early ED revisits have increased mortality and are at high risk of medical and legal problems arising from medical errors or patient dissatisfaction. Revisits to an ED after initial treatment and discharge can potentially further strain healthcare systems.

Thus, the objective of this study was to examine the factors associated with adverse events during unscheduled early revisits to ED Hospital USM. The prevalence, time frame and outcome of unscheduled early revisits to ED Hospital USM were studied as well.

CHAPTER 2: OBJECTIVES OF THE STUDY

2.1 General objectives

- To examine the factors associated with adverse events during unscheduled early revisits to ED Hospital USM from January 1, 2014 to January 31, 2015

2.2 Specific objectives

- To study the prevalence and outcome of unscheduled early revisits to ED Hospital USM
- To determine the time frame for most unscheduled revisits to ED Hospital USM

CHAPTER 3: MANUSCRIPT

3.1 TITLE

UNSCHEDULED EARLY REVISIT TO EMERGENCY DEPARTMENT OF HOSPITAL USM

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3.2 ABSTRACT

Introduction: Unscheduled revisits to the emergency department (ED) may present a considerable additional workload. This study investigated the risk factors contributing to adverse event during unscheduled early revisit to ED Hospital Universiti Sains Malaysia (USM).

Methods: A retrospective cohort study was conducted from January 2014 to January 2015 to character the nature of unscheduled early revisits to ED Hospital USM. It included all patients 18 years old and above, revisited ED within 9 days post discharge from ED.

Results: Data was collected from 492 case records. The rate of ED unplanned revisits within 9 days of previous ED discharge was 0.66% for the study period. Risk factors for revisit included advance age, pre-existing co-morbids, duration spent during first ED visit and health care system related error. The independent predictors of morbidity were diabetes mellitus (OR, 2.07; 95% CI, 1.08-3.96), respiratory disease (OR, 2.42; 95% CI, 1.18-4.98), gastrointestinal disease (OR, 5.93; 95% CI, 1.29-27.35), nervous system disease (OR, 4.65; 95% CI, 1.27-17.02), duration spent more than 6 hours during first ED visit (OR, 3.05; 95% CI, 1.53-6.07), and medical error leading to admission (OR, 8.85; 95% CI, 4.43-17.67). The overall mortality rate was 0.2% (1/492).

Conclusion: ED personnel need to be extra vigilant when managing patients with risk factors particularly the modifiable risk factors to curb ED revisit.

KEYWORDS: emergency department, factors, outcome, unplanned revisit

3.3 INTRODUCTION

Emergency departments (EDs) offer critical medical care, including diagnostic, resuscitation and stabilization. In other words, ED is frequently the initial contact between patients and secondary health care providers. In an ideal ED, disposition is always correct and all likely differential diagnoses are considered for that patient.[1] However, this ideal ED does not really exist. Although doctors, paramedics and other supporting staff work to their best of abilities, mistakes do occur in all parts of medicine for various reasons.

The demand for emergency care in every part of the world has been steadily increasing. Unscheduled revisits to the ED may present a considerable additional workload and it signifies a potential area for care improvement. In keeping with the objectives of emergency medicine service, the rate of early ED revisit is regarded as a quality of care indicator and a tool for improving patient care.[2] Many EDs of hospitals in developed countries track revisits. Nevertheless, the data on unplanned revisits to EDs in Malaysia remains lacking and there is no comprehensive hospital study. A rate of less than 1% had been proposed for this quality care indicator while the international data suggested a rate of roughly 3% as a reasonable estimation of the average global unscheduled revisit rate.[3,4] Nevertheless, this standard is not universally accepted. Unplanned revisit rates over a certain limit may indicate poor clinical care, system failures and poor access to alternative primary care services, therefore the underpinning causes should be investigated.

Generally, the use of 72-hour bounceback as the measure of interest for hospital quality metric had no known empirical basis.[5] Moore et al showed that the ED representation clustered around one week after the first visit and fell rapidly thereafter.[6]

Rising et al suggested that 9 days should be used as a more inclusive cutoff for studies of ED revisits.[7]

While there are limited publications on investigation of factors associated with ED revisits, previous studies have identified several important factors associated with higher 30 days readmission rates.[8] Understanding factors that are associated with ED reattendances is important as this can lead to targeted interventions of potentially modifiable risk factors. Han et al identified four categories of precipitating factors that influence early ED revisits, namely patient-related, illness-related, health care system–related and other factors.[2] It is not clear whether any of these factors are actually in the causal pathway of patient returns. Patients who make early ED revisits have increased mortality and are at high risk of medical and legal problems arising from medical errors or patient dissatisfaction. Revisits to an ED after initial treatment and discharge can potentially further strain healthcare systems.

Thus, the objective of this study was to examine the factors associated with adverse events during unscheduled early revisits to ED Hospital USM. The prevalence, time frame and outcome of unscheduled early revisits to ED Hospital USM were studied as well.

3.4 METHODOLOGY

This study was conducted in Hospital USM via retrospective case review of all relevant subjects. Sample frame referred to all patients 18 years old and older, revisited ED Hospital USM within 9 days post discharge from ED, which was not scheduled in the discharge plan, between January 1, 2014 and January 31, 2015. Unrelated problem during revisit and missing data were excluded from the study. The sample size calculated was 410 (exclusive of missing data) and the proposed duration of study was between January 1, 2014 and December 31, 2015. However, the convenience sampling was completed in 13 months (from January 1, 2014 until January 31, 2015).

We defined "unscheduled early revisit" as an unplanned revisit within 9 days of discharge from the ED, which was recommended by Rising et al as a more inclusive cutoff for ED revisits,[7] for the same chief complaint, which has not improved or has worsened. "Adverse events" in this study referred to the need for hospitalization or death following unscheduled revisits to the ED. "Health care system related factors" encompassed both diagnostic errors (discordance between the first and final diagnosis in ED records) and treatment errors (non-evidence based treatment). "Non health care system related errors" included both patient factors (demographic characteristics and psychosocial factors) and illness factors (disease progression and new health problems). "Left without formal discharge" referred to premature leaving of hospital without formal discharge from ED.

The data was collected from the record unit of Hospital USM. Patients' clinical records were reviewed retrospectively after obtaining approval from the director of hospital as well as Ethical Board and Committee. Ethical approval was obtained from the Human Research Ethics Committee USM (HREC) and study protocol code

USM/JEPeM/15110482 had been assigned prior to the commencement of the study. Data collection form was shown in Appendix. The data was then entered and analysed using Statistical Package for Social Science (SPSS) for windows, version 21.0.

The categorical data of the study population, namely gender, race and co-morbid(s) were analyzed using frequency and percentage. The numerical data of the study population such as age was analyzed either using mean or median based on normality of distribution. Simple and multiple logistic regression analyses were used to conclude the main objectives for unscheduled early revisits to the ED Hospital USM. The variables found to be associated with adverse event and with a p-value below 0.25 during simple logistic regression were then selected for multivariate analysis. Choosing p-value 0.25 instead of 0.05 during initial simple logistic regression allowed potential interaction to be considered significant. Those factors presenting a clinical interest but with a p-value above 0.25 were also included for variable selection.

Multivariable model yielding the best possible prediction was built using a stepwise selection based on likelihood ratio from both forward selection and backward elimination methods. The standard error and correlation were relatively small for seven of the independent variables in the backward LR model and therefore the model showed no significant interaction effect. Assumption was subsequently checked with the Hosmer-Lemeshow test. The p-value was 0.745, which was more than 0.05 and thus the model fitness was confirmed. Classification table concluded that overall correctly classified percentage was 80.1%. The ROC curve, along with measures of diagnostic accuracy optimizing the sensitivity and specificity were presented for this final model (Figure 1). Area under the ROC curve was 0.703 (95% CI 0.64, 0.76). Statistical significance was established as $p<0.05$.

3.5 RESULTS

The total attendances to ED Hospital USM from January 2014 until January 2015 were 74772. Out of 1034 total early representations, there were 492 unscheduled early revisits. The rate of ED unplanned revisits within 9 days of previous ED discharge in Hospital USM was 0.66% for the study period.

Demographic data, time to unscheduled revisit and outcome

A total of 492 subjects was included in this study, based on the unscheduled early revisits to ED Hospital USM from January 2014 to January 2015. The mean age of study subjects was 38.64 years old (Table 1). Meanwhile, the mean age of respondents with adverse event was 42.55 years old and that without adverse event was 37.47 years old. Males made up of 48.4% of study population and most of them (88.6%) were Malays. Other races classified under non-Malay were Chinese, Indian and foreigner (Siamese, Sudanese, African).

Majority of the study subjects had no underlying co-morbid. Hypertension (17.1%) and diabetes mellitus (11.4%) were the commonest co-morbids recorded. Cardiac diseases observed were ischemic heart disease, valvular heart disease and atrial fibrillation. Bronchial asthma and chronic obstructive pulmonary disease made up of respiratory diseases. Meanwhile, gastrointestinal diseases comprised of gastritis, cholelithiasis and liver cirrhosis. Chronic renal failure and nephrotic syndrome were the examples of renal diseases, whereas stroke and trigeminal neuralgia were grouped under nervous system diseases. Psychiatric diseases encountered were schizophrenia, bipolar disorder and major depressive disorder. There were 14 respondents with other co-

morbids, for instance, hyper/hypothyroidism, psoriasis, gout and systemic lupus erythematosus (SLE).

The mean time of unplanned revisits was 66.59 hours. Meanwhile, the mean time of unscheduled revisits with adverse event was 70.33 (SD 49.08) hours while that without adverse event was 65.48 (SD 50.36) hours.

Majority of unscheduled revisits were discharged home (74.4%) while 13 of them left without formal discharge from ED. There were 22.8% of cases required hospital admissions. Unfortunately, one patient passed away in ED after futile resuscitation.

Visit characteristics of unscheduled revisit

The visit characteristics of second presentation were near identical to those of first index visit. Respiratory problems scored the highest for all visits in ED Hospital USM, followed by gastro-intestinal and genito-urinary problems as well as trauma. The rest of the subjects had diseases of cardiovascular, musculoskeletal, central nervous, psychiatry and dermatology.

Duration spent during initial visit

Majority of the patients were discharged from ED Hospital USM within 2 hours during the first visit (Table 2). There were 8.9% study subjects spending more than 6 hours in ED before they were allowed home. The usual turn around time for most hospital ED discharges was 6 hours.

Causal factors of unscheduled revisit

Non health care system related cause accounted for 91.3% of all unscheduled early revisits, and adverse events were noted in 19.2% of the respondents. The rest of the cases were associated with health care system related cause, in which 62.8% of them had adverse events.

Associations between patient characteristics and adverse events for unscheduled early revisits to ED Hospital USM – A simple logistic regression

Simple logistic regression analysis was performed to identify the possible associated factors of unscheduled early revisits among patients who represented to ED Hospital USM. The outcome was categorized into two groups, those with adverse event (ward admission and death) and those without adverse event (hospital discharge). Of the 492 patients with unplanned early revisits, 113 cases (23.0%) had adverse event.

Based on the results shown in the Table 3, there were four associated factors found to be statistically significant with the p-value of less than 0.05. These factors include age ($p=0.004$), number of co-morbids ($p=0.021$), duration spent during first visit ($p=0.001$), and causal factor of revisit ($p<0.001$).

Co-morbids namely hypertension, diabetes mellitus, respiratory disease, gastrointestinal disease, renal disease, nervous system disease and cancer had p-value of less than 0.25. Gender, race, co-morbids like cardiac disease, psychiatric disease and other diseases, as well as time interval, however, were not statistically significant. Types of co-morbids and time interval, although statistically insignificant, were clinically important and subsequently selected for multiple logistic regression analysis to determine the association with adverse event for unscheduled early revisits.

Multiple logistic regression

All the four variables with p-value less than 0.25 and two other factors with p-value more than 0.25 but clinically significant were subsequently analyzed using multivariable logistic regression analysis in order not to miss the potential clinical interaction (Table 4). After controlling the confounders, the following six associated factors showed significant independent effect: respiratory disease (p=0.009; 95% CI, 1.62, 29.59), gastrointestinal disease (p=0.007; 95% CI, 2.16, 113.80), nervous system disease (p=0.007; 95% CI 1.94, 61.50), psychiatric disease (p=0.013, 95% CI 1.60, 55.78), duration spent during first visit (p=0.002; 95% CI, 1.52, 6.31) as well as causal factor (p<0.001; 95% CI, 4.27, 17.99).

Likelihood ratio logistic regression model was applied (Table 5). Using backward elimination method, diabetes mellitus was retained but psychiatric disease was subsequently excluded from the final model as the p-value of this variable was 0.054 (p>0.05). This study found that those patients with diabetes mellitus, respiratory, gastrointestinal and nervous system diseases had 2.07, 2.42, 5.93 and 4.65, respectively, times higher odds to experience adverse event if they returned with second ED visit. Those subjects spent more than 6 hours during first ED visit had 3.05 times higher chance to be admitted to hospital during unscheduled early revisit. Health care system related representations were 8.85 times associated with adverse event. A receiver operating characteristic curve was drawn using a prediction model comprising the six independent associated factors and was shown to perform satisfactorily with an area under the curve of 0.703.

3.6 DISCUSSION

In the current study, we studied the outcome of unscheduled early revisits with various associated factors in a retrospective cohort of adult patients revisited ED Hospital USM. Our study differed from previous works in several important ways. First, we reported that the rate of ED unscheduled early revisits within 9 days of previous ED discharge was 0.66% for the study period. January 2015 recorded the most number of ED early revisits, probably due to aftermath effect of record-setting floods in Kota Bahru, Kelantan in end of December 2014. Hospital USM was the only functioning hospital in Kelantan during that natural disaster and cases from other hospitals and clinics throughout the state had to be managed by Hospital USM. Previous researchers had demonstrated different results in different time frames. Second, our multivariable analysis revealed six independent factors to predict adverse outcome of unscheduled early revisits. These six factors were presence of diabetes mellitus, respiratory, gastrointestinal and nervous system diseases, as well as duration spent during first visit (more than 6 hours) and causal factor (health care system related). Among these six associated factors, duration spent during first visit was indeed one of the major differences in contrast to other studies since it was rarely mentioned in previous articles. Third, several important clinical factors such as number of co-morbids and interval to revisit, surprisingly failed to demonstrate a significant association to predict the outcome of unplanned early revisits in this study.

There was a variable rate in unscheduled ED revisit ranging from 0.4% to 49.3%.[4] Generally, the use of 72-hour bounceback as the measure of interest for hospital quality metric had no known empirical basis.[5] Moore et al showed that the ED representation clustered around one week after the first visit and fell rapidly thereafter.[6]

Adopting 9 days as a more inclusive cutoff time frame for study of ED revisit as advocated by Rising et al,[7] our study identified the mean interval of revisit was 66.59 hours and that with adverse event was 70.33 hours. It did not show any significant relationship between time of second ED visit and adverse event.

Demographic characteristics that were investigated in this study comprised of age, gender as well as race. There were 113 patients (23.0%) in this study unexpectedly admitted to hospital HUSM within 9 days after being discharged from the ED, with mean patient age of 42.55±18.08 years and elder subjects had a higher rate of adverse event. This finding was well described by Duseja et al that ED revisit rates were higher for patients between ages 18 and 44 than for patients 65 and older.[9] However, patients in the oldest age group were more likely to be admitted after a revisit.[10] Thus, improving and reorganizing elderly care had become a healthcare priority since older patients were more likely to experience higher rates of unwanted events. Overall, gender and race did not predict the risk of admission should the patient make an unscheduled early ED revisit. About 88.6% of the respondents in this study were Malays. This finding was not surprising as the current study was conducted in Hospital USM located in the state of Kelantan. According to the data from Department of Statistics Malaysia, about 85% of Kelantan's population was ethnic Malays.

On the other hand, patients with underlying respiratory and gastrointestinal diseases had higher revisits in our study. This finding was similar to most of the previous published articles.[2,11] It was reasonable that presentations like wheezing and abdominal pain, where the signs and symptoms may change with time, were more likely to result in an unplanned revisit compared to conditions such as chest pain that were potentially easier to risk-stratify and diagnose. Moskovitz & Ginsberg indicated that clinical deterioration was another important feature to ED revisits in which 37% of them

had worsening condition and 30% had not improved since their previous ED visits.[12] This was true especially if the patients had underlying co-morbids and they spent more than 6 hours during first index visit before ED discharge. The usual turn around time for ED discharges was 6 hours and observation longer than this duration should necessitate further assessment for probable admission during first index visit itself.

Health care system related factor was an essential source of unscheduled revisits, attributed by misdiagnosis, malpractice, inadequate communication between health care providers and patients as well as lack of subsequent referral services or continuity of care.[13,14,15] There were 43 cases related to health care system error in our study. Majority of the revisits had the same primary diagnosis as the initial ED visits. Most of the cases of missed diagnosis had very non-specific presentations. One of the examples documented was patient initially treated as acute dyspepsia returned as acute pancreatitis within the same day, in which both of the presentations were almost similar clinically but with different biochemical results. Inexperienced doctors may easily discharge these patients prematurely from the busy and crowded ED at the index visit if the index of suspicion was low.

In summary, risk factors for adverse event during ED revisit universally include advance age, pre-existing co-morbids in particular diabetes mellitus, respiratory, gastrointestinal, nervous system and psychiatric diseases, along with duration spent during first ED visit and health care system related factor. The independent predictors of morbidity were diabetes mellitus (OR, 2.07; 95% CI, 1.08-3.96), respiratory disease (OR, 2.42; 95% CI, 1.18-4.98), gastrointestinal disease (OR, 5.93; 95% CI, 1.29-27.35), nervous system disease (OR, 4.65; 95% CI, 1.27-17.02), duration spent more than 6 hours during first ED visit (OR, 3.05; 95% CI, 1.53-6.07), and medical error leading to admission (OR, 8.85; 95% CI, 4.43-17.67).

3.7 CONCLUSION

ED is a multidisciplinary unit and patients present with multiple diseases involving complex medical, psychosocial and behavioral factors. ED revisit crucially increases burden not only to patients but also to staff and health care system. The presence of diabetes mellitus as well as respiratory, gastrointestinal and nervous system diseases warrants careful assessment and management at the first visit. Appropriate medical intervention is recommended if duration spent during first visit exceeds 6 hours and comprehensive discharge planning is effective for smooth transition from hospital to home. Continuity of care to discharged patients may also result in improved quality of care, reduced revisit rates along with increased patient satisfaction. To minimize the frequency of health care system related errors, targeted ED-based clinical audit regarding serious medical errors in case management, continuous medical education and vocational training programs are equally important. After all, ED physicians need to be extra vigilant when managing patients with risk factors particularly the modifiable risk factors to curb ED revisit.

LIMITATION

This study was based on retrospective patient documentation. The sample size was relatively small. It reflected the experience of a single health centre and patients who might have visited other hospital EDs after their first visits to the study setting would not be identified.

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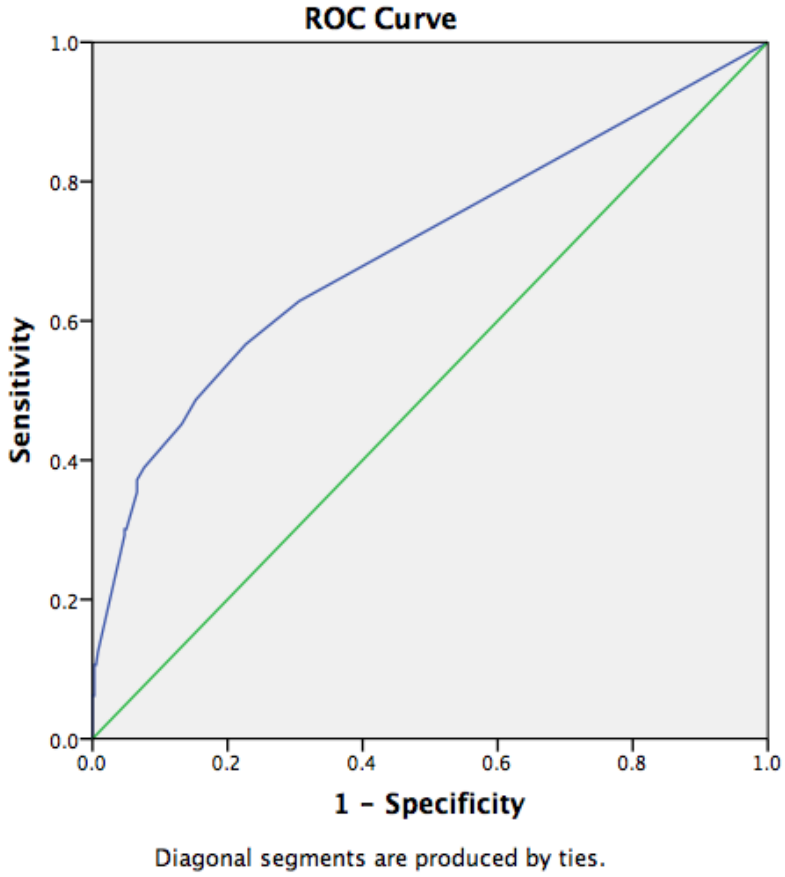

*Multivariable model: diabetes mellitus, respiratory disease, gastrointestinal disease, nervous system disease, duration spent during initial visit, causal factors of revisit

Area Under the Curve

Test Result Variable(s): Predicted probability

Area	Std. Error[a]	Asymptotic Sig.[b]	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
.703	.031	.000	.643	.764

The test result variable(s): Predicted probability has at least one tie between the positive actual state group and the negative actual state group. Statistics may be biased.

a. Under the nonparametric assumption

b. Null hypothesis: true area = 0.5

Figure 1. Receiver operating curve predicting the adverse events for unscheduled early revisits using the multivariable model

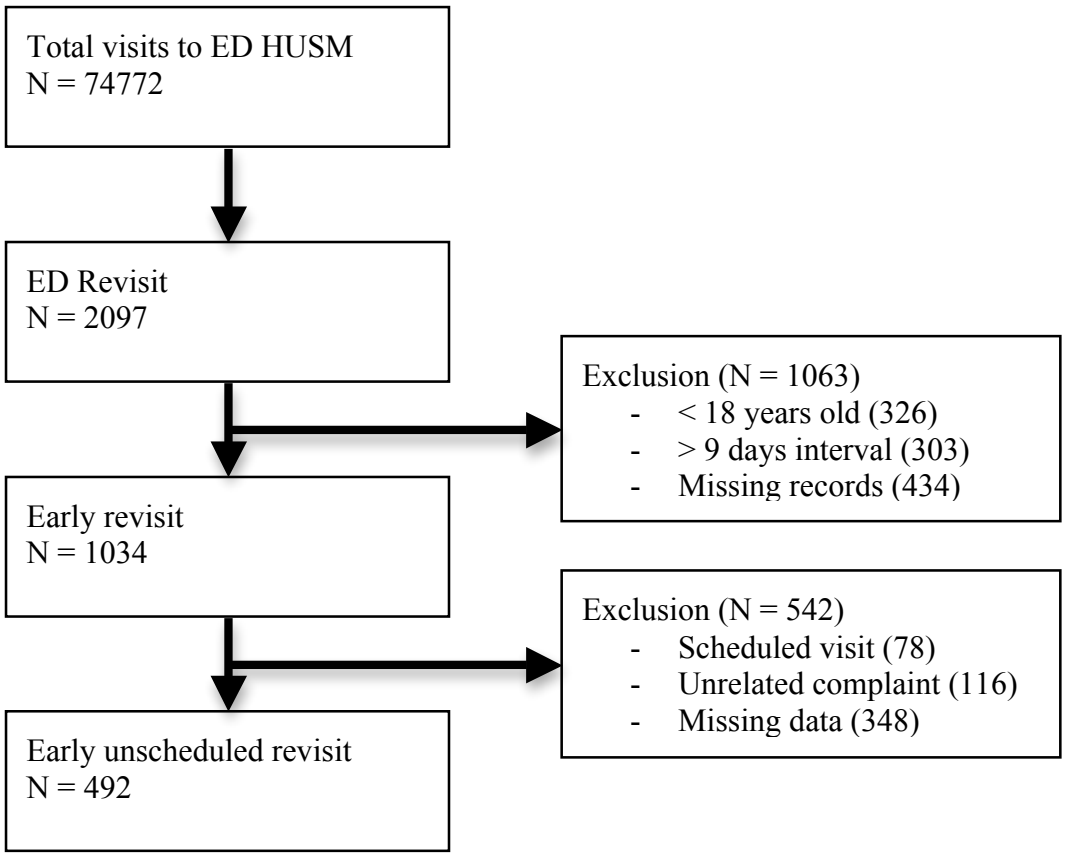

Figure 2. Flow Chart of The Study

Table 1. Demographic characteristics and time to unscheduled revisit of the entire study group

Variables		Unscheduled early revisit N (%)	Patients with no adverse events N (%)	Patients with adverse events N (%)
Age (years)	Mean	38.64 (SD 16.47)	37.47 (15.80)	42.55 (18.08)
	18 – 44	323 (65.7)	258 (79.9)	65 (20.1)
	45 – 64	126 (25.6)	95 (75.4)	31 (24.6)
	65 and above	43 (8.7)	26 (60.5)	17 (39.5)
Gender	Male	238 (48.4)	183 (76.9)	55 (23.1)
	Female	254 (51.6)	196 (77.2)	58 (22.8)
Race	Malay	436 (88.6)	336 (77.1)	100 (22.9)
	Non Malay	56 (11.4)	43 (76.8)	13 (23.2)
Co-Morbid(s)	Nil	314 (63.8)	257 (81.8)	57 (18.2)
	Hypertension	83 (16.9)	56 (67.5)	27 (32.5)
	Diabetes mellitus	56 (11.4)	36 (64.3)	20 (35.7)
	Cardiac disease	17 (3.5)	12 (70.6)	5 (29.4)
	Respiratory disease	43 (8.7)	30 (69.8)	13 (30.2)
	Gastrointestinal disease	9 (1.8)	3 (33.3)	6 (66.7)
	Renal disease	8 (1.6)	4 (50.0)	4 (50.0)
	Nervous system	10 (2.0)	5 (50.0)	5 (50.0)
	Psychiatric disease	14 (2.8)	9 (64.3)	5 (35.7)
	Cancer	13 (2.6)	7 (53.8)	6 (46.2)
	Others	14 (2.8)	9 (64.3)	5 (35.7)
Time Interval (day)	Mean (SD)	66.59 (50.06)	65.48 (50.36)	70.33 (49.08)
	1 (<24 h)	106 (21.5)	86 (81.1)	20 (18.9)
	2 (24 – <48 h)	123 (25.0)	94 (76.4)	29 (23.6)
	3 (48 – <72 h)	81 (16.5)	62 (76.5)	19 (23.5)
	4 (72 – <96 h)	62 (12.6)	48 (77.4)	14 (22.6)
	5 (96 – <120 h)	44 (8.9)	32 (72.7)	12 (27.3)
	6 (120 – <144 h)	27 (5.5)	19 (70.4)	8 (29.6)
	7 (144 – <168 h)	21 (4.3)	16 (76.2)	5 (23.8)
	8 (168 – <192 h)	15 (3.0)	11 (73.3)	4 (26.7)
	9 (192 – <216 h)	13 (2.6)	11 (84.6)	2 (15.4)

Table 2. Duration spent during first visit

Duration spent during first visit (hour)	Unscheduled early revisit N (%)	Patients with no adverse events N (%)	Patients with adverse events N (%)
<1	155 (31.5)	132 (85.2)	23 (14.8)
1 – <2	158 (32.1)	121 (76.6)	37 (23.4)
2 – <3	62 (12.6)	43 (69.4)	19 (30.6)
3 – <6	73 (14.8)	58 (79.5)	15 (20.5)
6 – <12	36 (7.3)	20 (55.6)	16 (44.4)
12 – <24	8 (1.6)	5 (62.5)	3 (37.5)

Table 3. Associated factors toward adverse event in patients with unscheduled early revisits: A simple logistic regression

Variables		Patients with no adverse events N (%)	Patients with adverse events N (%)	Odd Ratio (95% CI)	p value
Age (years)	Mean (SD)	37.47 (15.80)	42.55 (18.08)	1.02 (1.01, 1.03)	0.004
Gender	Male	183 (76.9)	55 (23.1)		
	Female	196 (77.2)	58 (22.8)	0.99 (0.65, 1.50)	0.942
Race	Malay	336 (77.1)	100 (22.9)		
	Non-Malay	43 (76.8)	13 (23.2)	1.04 (0.27, 3.14)	0.515