# PREDICTIVE FACTORS FOR SPECIAL CARE UNITS ADMISSION AND IN-HOSPITAL MORTALITY OF GERIATRIC PATIENTS THAT PRESENTED TO RED ZONE OF THE EMERGENCY DEPARTMENT OF HOSPITAL UNIVERSITI SAINS MALAYSIA

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| | |
|---|---|
| CCU | Cardiac Care Unit |
| CPR | Cardiopulmonary Resuscitation |
| ED | Emergency Department |
| HDU | High Dependency Unit |
| HUSM | Hospital Universiti Sains Malaysia |
| ICU | Intensive Care Unit |
| NIV | Non-invasive Ventilation |
| USM | Universiti Sains Malaysia |
| WHO | World Health Organization |

## ABSTRAK

**Pengenalan:**

Objektif kajian ini bertujuan untuk menentukan perkadaran pesakit geriatrik yang dirawat di Zon Merah Jabatan Kecemasan di Hospital Universiti Sains Malaysia (USM), dan faktor-faktor yang berkaitan dengan kemasukan unit perawatan khas dan mortaliti dalam hospital.

**Metodologi:**

Kajian ini adalah satu kajian rentas pusat tunggal dilakukan dari 1 Januari 2016 - 31 Disember 2016 di Zon Merah Jabatan Kecemasan Hospital USM. Semua pesakit berumur 60 tahun ke atas dimasukkan dalam kajian ini. Pesampelan secara rawak sistematik digunakan. Pembolehubah dianalisis dengan menggunakan kaedah "simple logistic regression" dan "multiple logistic regression".

**Keputusan:**

Jumlah pesakit yang dimasukkan ke dalam kajian ini adalah 328 pesakit, 55.8% adalah lelaki dan 91.2% adalah orang Melayu. Purata umur pesakit-pesakit dalam kajian adalah 70.6 tahun. Kes-kes pesakit geriatric yang kerap dirawat ialah kes-kes sistem kardiovaskular (31.4%), penyakit berjangkit (29.6%), neurologi (14.9%), dan system pernafasan (12.5%). Daripada 328 pesakit yang dikaji, 187 pesakit (57.0%) dimasukkan

ke wad umum, 110 pesakit (33.5%) dimasukkan ke unit perawatan khas. 55 pesakit (16.8%) meninggal dunia dalam tempoh rawatan di hospital. Faktor yang dikaitkan dengan kemasukan unit perawatan khas ialah penggunaan alat sokongan pernafasan tidak-invasif, dan penggunaan ubat inotropik. Sebaliknya, faktor yang berkaitan dengan mortaliti dalam hospital adalah tahap urea darah, tahap serum albumin dan penggunaan alat sokongan pernafasan mekanikal.

**Kesimpulan:**

Pesakit geriatrik yang dirawat di Zon Merah Jabatan Kecemasan yang memerlukan alat sokongan pernafasan dan sokongan inotropik telah menunjukkan kesudahan perawatan yang lebih teruk. Faktor-faktor yang dikaitkan dengan kemasukan unit perawatan khas dan mortaliti dalam hospital telah dikenalpasti melalui kajian ini, dan ia akan menyumbang dalam pembentukan sistem hospital dan kesihatan yang lebih baik bagi memenuhi keperluan pesakit geriatrik yang kritikal.

# ABSTRACT

**Introduction:**

The objective of this study aimed to determine the prevalence of geriatric patients being treated in Red Zone of Emergency Department in Hospital Universiti Sains Malaysia (USM), and factors associated with special care unit admission and in-hospital mortality.

**Methodology:**

This study was a single centre prospective cross-sectional study which was carried out from 1 January 2016 – 31 December 2016 at Red Zone of the Emergency Department Hospital USM. All patients aged 60 years and above were included. Systematic random sampling was used. Variables were analyzed using simple and multiple logistic regressions.

**Results:**

Total patients included in this study were 328 patients, 55.8% were male and 91.2% were Malay. The mean age was 70.6 years old. The cases geriatric patients commonly presented were cardiovascular (31.4%), infectious disease (29.6%), neurology (14.9%), and respiratory (12.5%). Out of 328 patients studied, 187 patients (57.0%) were admitted to general wards, 110 patients (33.5%) were admitted to SCU. 55 patients (16.8%) passed away within the period of in-hospital treatment. Factors associated with SCU admission

were the usage of NIV, and the usage of inotropic support. On the other hand, factors associated with in-hospital mortality were blood urea level, serum albumin level and the application of mechanical ventilation.

**Conclusions:**

Geriatric patients who presented to Red Zone of ED requiring ventilator and inotropic support had shown to have worse outcome. The associated factors for SCU admission and in-hospital mortality had been identified, and this will enable better settings cater to the needs for critically ill geriatric patients.

# CHAPTER 1: INTRODUCTION

## 1.1    Aging of the Human Population

The definition of old age or elderly differs in different countries. In Malaysia, the Ministry of Health defines elderly persons as those who are 60 years or older (1), which is similar as the definition recommended by WHO. The human population is ageing and this phenomenon occurs in nearly all the countries of the world.

The proportion of the global elder population was 9.2 per cent in 1990 and had increased to 11.7 per cent in 2013. The proportion is expected to grow continuously reaching 21.1 per cent by 2050. The number of older persons may also be more than double, from 841 million people in 2013 to more than 2 billion in 2050 (2).

With the improvement of the general health care and living condition, people are living longer lives than their previous generations almost everywhere. This leads to a decreasing in mortality. Together with declining of fertility, the ageing of the world population is unavoidable circumstance.

## 1.2     Burden Following the Ageing of Population

Along with the ageing of the population come major social and economic consequences. Besides that, many problems unique to elderly also follow. This brings new challenges and demands on the health care and social services in the country.

In general, the health care system in Malaysia is a comprehensive medical and health care service for the general population. Apart from acute conditions, elderly patients may often present with chronic diseases and disability which required long term care. The current health care system is inadequate in providing service to these elderly patients as special programs for the aged are still lacking (3).

With increasing demand on health care service among the elderly population, it is important that the health care and social care systems adapt to the situation and aim at promoting health while providing treatment focusing on health care of the elderly population.

## 1.3 Justification of the Study

The ED plays a central role in between inpatient and outpatient care within the health care system. This unique position gives important implication in the treatment of the elderly population, apart from serving as a platform for subsequent care to be provided. In the United States of America, the geriatric ED patients represented 43% of admissions (4). The expertise which an ED staff can offer to a geriatric patient can meaningfully impact the patient's condition.

As the elderly population increases, the subsequent need for health care in geriatric emergency service is also increasing. This is evidenced by the larger and ever increasing proportion of geriatric ED visits. Thus there are many challenges in ED to effectively and reliably improve post-ED geriatric patient's outcomes.

Besides that, many geriatric ED problems still remain under-researched leaving uncertainty in optimal management strategies. The research work and local data regarding geriatric ED patients in Malaysia is very much lacking. More works need to be done in order to improve the care both in individual EDs and system-wide, subsequently resulting in better, more cost effective care and ultimately better outcomes in geriatric ED patients.

**References:**

1.      Karim H. The elderly in Malaysia: demographic trends. Medical Journal of Malaysia. 1997;52:206-12.

2.      World Population Ageing 2013. United Nations, Department of Economic and Social Affairs, Population Division. Division DoEaSAP; 2013.

3.      Mafauzy M. The problems and challenges of the aging population of Malaysia. The Malaysian journal of medical sciences: MJMS. 2000;7(1):1.

4.      Geriatric emergency department guidelines. Geriatric, Emergency Department Guidelines Task Force. American College of Emergency Physicians. Emergency Nurses Association; 2014. Report No.: 1097-6760 Contract No.: 5.

**CHAPTER 2: STUDY PROTOCOL**

## 2.1 Introduction

The human population is ageing all around the world. This phenomenon is the results of longer lifespan as well as declining fertility of human population. Different countries define old age or elderly differently. The Ministry of Health in Malaysia and the World Health Organization (WHO) have similar definition of older persons as those who are 60 years and older (1). The global elder population was 9.2 per cent in 1990 and the figure increased to 11.7 per cent in 2013. It was expected to continue to rise to 21.1 per cent by 2050. Besides that it was estimated that the number of older persons to be increased from 841 million people in 2013 to more than 2 billion in 2050 (2).

As the world population ages, it gives great impact on social and economy of the countries. The elderly population generally presents a lot of problems unique to elderly and has generated new challenges and demands on the health and social services. Elderly patients often require long term care with their chronic diseases and disability, however the general health care system in Malaysia is implemented in such that treatments are usually in short term care and hospitalization (3).

## 2.2    Justification of the Study

Although Malaysia has quite comprehensive medical and health care services for the general population, special programs for the aged are lacking. This is in part due to lack of trained personnel in geriatric health care and also a lower priority being given to geriatric care (3).

The ED has a central role in between inpatient and outpatient care within current health care system. This unique position gives the opportunity to "set the stage" for subsequent care provided, apart from the important implication in the treatment of the geriatric population. The geriatric ED patients in the United States of America represented 43% of hospital admissions. Along with the increased in elderly population comes the subsequent increased need for health care in geriatric emergency service, as evidenced by the large, and ever increasing proportion of geriatric ED visits (4). The expertise which an ED staff can offer to a geriatric patient can meaningfully impact the patient's condition.

The primary challenge in ED is to effectively and reliably improve post-ED geriatric patient's outcomes. Indeed many geriatric ED problems are under-researched in which leaving uncertainty in optimal management strategies. The research work and local data regarding geriatric ED patients in Malaysia is inadequate. Improvement of the service in individual EDs and system-wide is achievable with more research work on ED geriatric patients, resulting in more cost effective care and better outcomes in ED geriatric patients.

## 2.3    Literature Review

Older patients represent an ever-increasing population in the ED. This subgroup of the population in fact uses emergency services at higher rates and with distinctive patterns of presentation and care needed in ED. A systemic review of 11 international large-scale ED use studies showed ED visits by older persons composed of 12% to 21 % of all ED visits, with exception of an American study of 3 rural hospitals with disproportionally lower rate of ED use in older persons, which suggesting of possible differences in the patterns of ED use among elderly population in rural areas and urban areas (5). The literature also showed about one third to one half of all elderly patients ED visits resulted in hospitalization, which is 2.5 to 4.6 times higher than the hospitalization rates for younger patients.

In a single-center retrospective study (6) stated that the main complaints among the elderly patients presented to ED were fall (18.3%), chest and upper back pain (14.2%), dyspnoea (13.7%), chronic extremity pain (10.2%), abdominal pain (9.9%), and fever (8.6%). The outcome that was taking into consideration in this study was disposition of the elderly patients in ED. 73.3% of the total sample was discharged from ED while in-hospital admission involved services of the following medical expertise: cardiology (7.3%), neurology (5.6%), general surgery (3.3%), chest diseases (2.5%) and internal medicine (2.3%).

Compared with younger patients presented to ED, literature found that elderly ED patients had a higher proportion of urgent visits, longer ED stay, requiring more staff time and resources. When elderly patients were admitted from ED, they were more likely to require ICU care. Their problems were more often of a medical nature, as opposed to surgical and psychiatric conditions. The most common medical diagnoses among elderly ED patients were ischemic heart disease, congestive heart failure, cardiac dysrhythmias, syncope, acute cerebrovascular accidents, pneumonia, abdominal disorders, dehydration, and urinary tract infections (5), however there was no proportion of these diagnoses given in the literature.

The elderly patients seeking emergency care were at high risk for adverse health outcomes. They had higher risk of functional decline, hospitalization, ED return and death in the 6 months after their ED index visit. The baseline functional dependence was the most prevalent risk factor predicting various adverse outcomes among elderly ED patients, identified in 7 of the 10 studies reviewed (5). Among the common risk factors were advanced age, recent hospitalization or ED visit, living alone, and lack of social support poor general health, co-morbidity, polypharmacy, and certain diagnoses which included cardiovascular disorders, diabetes, cognitive impairment, depression.

The SAFES cohort showed that 35.3% was male in analyzing mortality among 1306 elderly patients in nine French hospitals (7). Looking into co-morbidity using Charlson co-morbidity score, 16.6% had score of 3 or higher (RR = 1.62; 95% CI = 1.09-2.40, p =

0.02). The study also found that certain medical factors: malnutrition or risk thereof (HR = 1.92; 95% CI = 1.17–3.16), delirium (HR = 1.80; 95% CI = 1.24–2.62), a high level of co-morbidity (HR = 1.62; 95% CI = 1.09–2.40) to be independently related to 6-month mortality.

SAFES cohort also found that 28% of total analyzed sample had rehospitalization (RR = 4.47; 95% CI = 3.16-6.33, p<0.001) and institutionalization to long-term care facility (HR = 1.92; 95% CI = 1/37-2.71) were independent markers of this event, giving a negative impact. However, unplanned readmission was not identified as an independent marker of long-term care facility institutionalization (7). The effect of these two factors on the outcome of the elderly had not been studied prior to the SAFES cohort.

In a study on ICU use and mortality in elderly, it was found that the ICU use was frequent for congestive heart failure (15.9% of general medical admission), myocardial infarctions (7.9% of general medical admission), angina pectoris (7.8% of general medical admission), and cardiac arrhythmia (3.4% of general medical admission) (8). The author also found that both in-hospital and 90-day mortality rates were higher for hospitalization with ICU admission compared with hospitalization without ICU admission, and mortality rates increased with age.

Another study in Singapore analyzed all adults admitted to ICU from January 2008 to April 2010, out of 1563 patients 45.4% of the patients were ≥65 years of age. Elderly

patients had significantly higher mortality in both the ICU (20.9 versus 16.3%, $P = 0.02$) and hospital (33.6 versus 20.6%, $P < 0.001$). The cumulative incidence of mortality in-hospital and after discharge from the hospital were both markedly higher in the elderly group (all $P < 0.001$) (9). This study also analyzed the variables which were associated with in-hospital mortality and mortality following the patients' discharge from the hospital. The analysis revealed that low hemoglobin level were independently associated with a higher risk of mortality in both elderly and non-elderly groups. Besides that, the number of comorbidities also had the same correlation in mortality. Elderly patients who were admitted to ICU were at 2.3 times higher risk in mortality compared to the general population in this age group.

In elderly population, institutionalization, either general medical admission or ICU admission, was most often endured rather than desired. In addition, the challenges of aging populations in industrialized countries would increasingly result in an insufficient number of places available in institutions for the number of persons who needed placement (7). There is a clear need to control the factors that are potentially modifiable so as to limit recourse to this solution as much as possible. The identification of high-risk elderly patients is the first step in targeting appropriate interventions to promote positive patient outcomes.

**2.4    Research Questions, Research Hypothesis, Objective**

<u>**Research  Questions**</u>

1) What is the demographic pattern of disease among the geriatric patient presenting to Red Zone of the ED of HUSM?

2) What are the predictive factors for special care units (ICU, HDU, CCU) admission from Red Zone among geriatric patients presenting to ED, HUSM?

3) What are the predictive factors for in-hospital mortality among geriatric patients who are treated in Red Zone of the ED, HUSM?

<u>**Research Hypothesis**</u>

There are associations between advanced age, gender, co-morbidities, and special care units admission as well as in-hospital mortality among geriatric patients who are treated in Red Zone of the ED, HUSM.

<u>**Objectives**</u>

**General Objective:**

1. To analyze the prevalence and demographic pattern of disease among the geriatric patient presenting to Red Zone of the ED, HUSM.

**Specific Objectives:**

1. To determine the predictive factors for special care units (ICU/HDU/CCU) admission from Red Zone among geriatric patients presenting to ED, HUSM.

2. To determine the predictive factors for in-hospital mortality among geriatric patients who are treated in Red Zone of the ED, HUSM.

<u>**Definitions**</u>

•       **Elderly/older/geriatric patient(s)** = Patient(s) who is/are in the age of 60 year and older.

•       **Red Zone of the ED** = Critical care area for immediate care and resuscitation of critically ill patients.

•       **Special care units** = A collective term that is used to represent disposition/admission other than general care wards, which includes Intensive Care Unit (ICU), High Dependency Unit (HDU), and Cardiac Care Unit (CCU).

•       **In-hospital mortality** = Death of the patient, directly or indirectly due to the illness being treated, within the period of receiving treatment in the hospital, from receiving initial care in the ED, until definitive care in general medical wards and special care units, i.e., ICU, HDU, CCU.

•       **Co-morbidity** = The underlying medical or surgical disease(s) that accompany the acute illness(es) which bring the subject to the Red zone of the ED to receive treatment.