



# Mapping clinical journeys of Asian patients presenting to the Emergency Department with syncope: Strict adoption of international guidelines does not reduce hospitalisations



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## ABSTRACT

**Background:** Limited data exists about management of syncope in Asia. The American College of Emergency Physicians (ACEP) and European Society of Cardiology (ESC) guidelines have defined the high-risk syncope patient. This study aims to determine the effectiveness of managing syncope in an Asian healthcare system and whether strict adherence of international guidelines would reduce hospitalizations.

**Methods:** Patients attending the Emergency Department of a Singaporean tertiary hospital with syncope were identified. Clinical journeys of all patients were meticulously mapped by interrogation of a comprehensive electronic medical record system and linkages with national datasets. Primary endpoint was hospitalization. Secondary endpoints were recurrent syncope within 1 year and all-cause mortality. Expected admission rates based on application of ACEP/ESC guidelines were calculated.

**Results:** 638 patients (43.8 ± 22.4 years, 49.0% male) presented with syncope. 48.9% were hospitalized for 2.9 ± 3.2 days. Yields of common investigations ranged from 0 to 11.5% and no diagnosis was reached in 51.5% of patients. Diuretics use (HR 5.1, p = 0.01) and prior hospitalization for syncope (HR 6.9, p < 0.01) predicted recurrent syncope. Over 2.8 SD 0.3 years of follow-up, 40 deaths occurred. 24 patients who died within 12 months of presentation were admitted or had a firm diagnosis upon discharge. Application of guidelines did not significantly reduce hospitalisations, with limited agreement which patients warrant admission. (Actual 376, ACEP 354, ESC 391 admissions, p = NS).

**Conclusions:** Unstructured management of syncope results in nearly half of patients being admitted and substantial healthcare expenditures, yet with limited diagnostic yield. Strict adoption of ACEP or ESC guidelines does not reduce admissions.

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## 1. Introduction

Up to 35% of the general population may experience syncope in their lifetimes and thus syncope is a common cause for hospital attendance [1–5]. Syncope due to a cardiac aetiology is associated with increased risk of short-term mortality [2,3]. Due to clinicians' concerns about missing such diagnoses, a significant proportion of syncopal patients presenting to the Emergency Department (ED) is admitted for urgent evaluation. Consequently, based largely on data from Western countries, healthcare expenditure for the evaluation of syncope is substantial with limited diagnostic yield from multiple tests [1,6–11]. International

guidelines have described clinical features that are predictive of short-term adverse outcomes [5,12]. In this study, the clinical journeys of Asian syncope patients presenting to the Emergency Department of an academic medical centre in Singapore, a multi-racial country located in tropical Southeast Asia were meticulously tracked. The aims of this study are several-fold: firstly, determine the effectiveness of clinical management; secondly, evaluate the potential impact of strict adoption of international guidelines on admission rates and finally, as a process-mapping exercise to identify targets for intervention which could improve cost- and clinical effectiveness.

## 2. Methods

### 2.1. Participants

Consecutive patients presenting to the National University Hospital (NUH) ED in 2012 with syncope were identified. Syncope was defined

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as transient loss of consciousness characterized by rapid onset, short duration, and spontaneous complete recovery. All patients had been assigned one of the following International Classification of Diseases (ICD-10) codes and its sub-categories upon discharge from the Emergency Department: syncope and collapse (R55.0) and heat syncope (T67.1). Baseline demographics, clinical characteristics and details relating to the syncopal event were recorded. The entire clinical journey for each patient starting from presentation to the ED, until the 20th April 2015, notably any investigations undertaken for evaluation of syncope, management plans and clinical progress, were tracked using a comprehensive electronic medical records system. This was a retrospective cohort study conducted at a 1100 bedded academic medical centre in Singapore. The NUH ED was attended by 146,851 patients during the study period.

The primary endpoint was all-cause mortality and this was determined on the 20th April 2015 via linkages with National Registry of Diseases Office (NRDO) datasets. The NRDO was established by the Ministry of Health, Singapore to collect data on selected major diseases and health conditions such as cancer, acute myocardial infarction, stroke, kidney failure and track mortality status for all Singaporeans and its permanent residents. The secondary endpoint was repeat ED attendance with syncope within 12 months of the index presentation. The study protocol conforms to the ethical guidelines of the 1975 Declaration of Helsinki as reflected in a priori approval by the institution's human research committee (2014/0424).

## 2.2. Pre-existing management of syncope

At the ED, all patients were assessed by detailed history taking, clinical examination, and routine blood investigations including full blood count, electrolytes and a 12 lead ECG. In 2012, there was no fixed protocol to determine which syncopal patients were admitted. The decision to admit was based solely on the attending clinician's judgement and usual practise. However, the following general principles provided guidance:

- Patients with syncope due to probable cardiac or neurological causes, unexplained abnormalities in their blood investigations or ECG were admitted for further evaluation
- Patients with significant head trauma due to syncope were admitted for neurological monitoring
- Patients with stereotypical features of vasovagal syncope were reassured and given lifestyle modification advice on how to avoid recurrent syncope

Patients expected to be discharged within 24 h were admitted to the Emergency Department Treatment Unit (EDTU). If hospitalization was anticipated to exceed 24 h, patients were admitted to the internal medicine, neurology or cardiology services, according to what the ED physician deemed was the most appropriate disposition.

## 2.3. Application of American College of Emergency Physicians and European Society of Cardiology guidelines

The American College of Emergency Physicians (ACEP) and European Society of Cardiology (ESC), in 2007 and 2009 respectively, have published evidence-based recommendations to guide which patients should be hospitalized or evaluated early due to the presence of high risk criteria (Table 1). Patients in our cohort who fulfilled these criteria were identified and tallied to determine how strict adherence to these guidelines would impact on admission rates. In this study, an age cut-off of 60 years was arbitrarily used as the definition of older age duration application of the ACEP guidelines.

**Table 1**

High risk American College of Emergency Physicians (ACEP) and European Society of Cardiology (ESC) guidelines.

High risk ACEP (2007) criteria	High risk ESC (2009) criteria
<ul style="list-style-type: none"> <li>• History or presence of heart failure, coronary artery disease or structural heart disease</li> <li>• Haematocrit of less than 30</li> <li>• Older age and associated comorbidities</li> <li>• Abnormal ECG</li> </ul>	<ul style="list-style-type: none"> <li>• Severe structural heart or coronary artery disease, heart failure</li> <li>• Electrolyte disturbance</li> <li>• Severe anaemia</li> <li>• Syncope during exertion or supine</li> </ul>
	<ul style="list-style-type: none"> <li>• Palpitations at the time of syncope</li> <li>• Family history of sudden cardiac death</li> <li>• Non-sustained VT</li> <li>• Bifascicular block</li> <li>• QRS duration greater than 120 ms</li> <li>• Sinus bradycardia or sino-atrial block</li> <li>• Pre-excited QRS complex</li> <li>• Prolonged or short QT interval</li> <li>• Brugada ECG pattern</li> <li>• Right precordial lead changes suggestive of arrhythmogenic right ventricular cardiomyopathy</li> </ul>

## 2.4. Statistical analysis

Continuous variables and categorical variables were described by means  $\pm$  standard deviation and percentages, respectively. An independent samples *t*-test and paired samples *t*-tests were performed for comparisons of independent and paired data respectively. Chi-squared test was used for categorical data. To determine the association between clinical characteristics and syncope recurrence, multivariate Cox proportional regression analyses were performed and results were expressed as hazard ratios (HRs) with 95% confidence intervals (CIs). *p*-Value of less than 0.05 was considered as statistically significant. All analyses were performed using SPSS Statistics 23 (IBM, Armonk, NY, USA).

## 3. Results

### 3.1. Baseline demographics and clinical characteristics

1034 patients who attended the NUH ED in 2012 were assigned the ICD-10 codes syncope and collapse (R55.0) and heat syncope (T67.1). Upon review of the medical records, 396 patients were excluded as they did not experience syncope. The remaining 638 patients formed the study cohort. Patient demographics are listed in Table 2. The mean age was 43.8 years but there was a bimodal distribution of ages with a peak between the ages of 21–30 and a second peak at 51–60 years old (Fig. 1). There were less Chinese patients relative to the racial composition of Singapore (Singapore 2010 Census 74.0% Chinese, 13.4% Malay, 4.8% Indian and 3.3% other ethnicity).

### 3.2. Details of syncopal event

For 87.2% of patients, it was their first presentation to the ED with syncope (Table 3). 81.1% of patients had never experienced syncope prior to the episode that prompted their ED attendance. The remaining 18.9% had a mean of 0.5 SD 4.2 syncopal episodes in the 12 months prior to presentation with a mean history of 6.6 SD 23.8 months. 74.5% of episodes occurred between 6 am to 6 pm. 56% of patients experienced prodromal symptoms prior to onset of syncope with dizziness, darkening of vision, nausea and vomiting and palpitations reported by 53.5%, 10.9%, 7.0% and 6.4% of patients respectively. Syncope was witnessed in 60.7% of cases and features of epileptiform activity such as loss of urinary incontinence, convulsion and tongue-biting being reported in 4.6% of cases. Head injury or limb trauma requiring suturing was

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